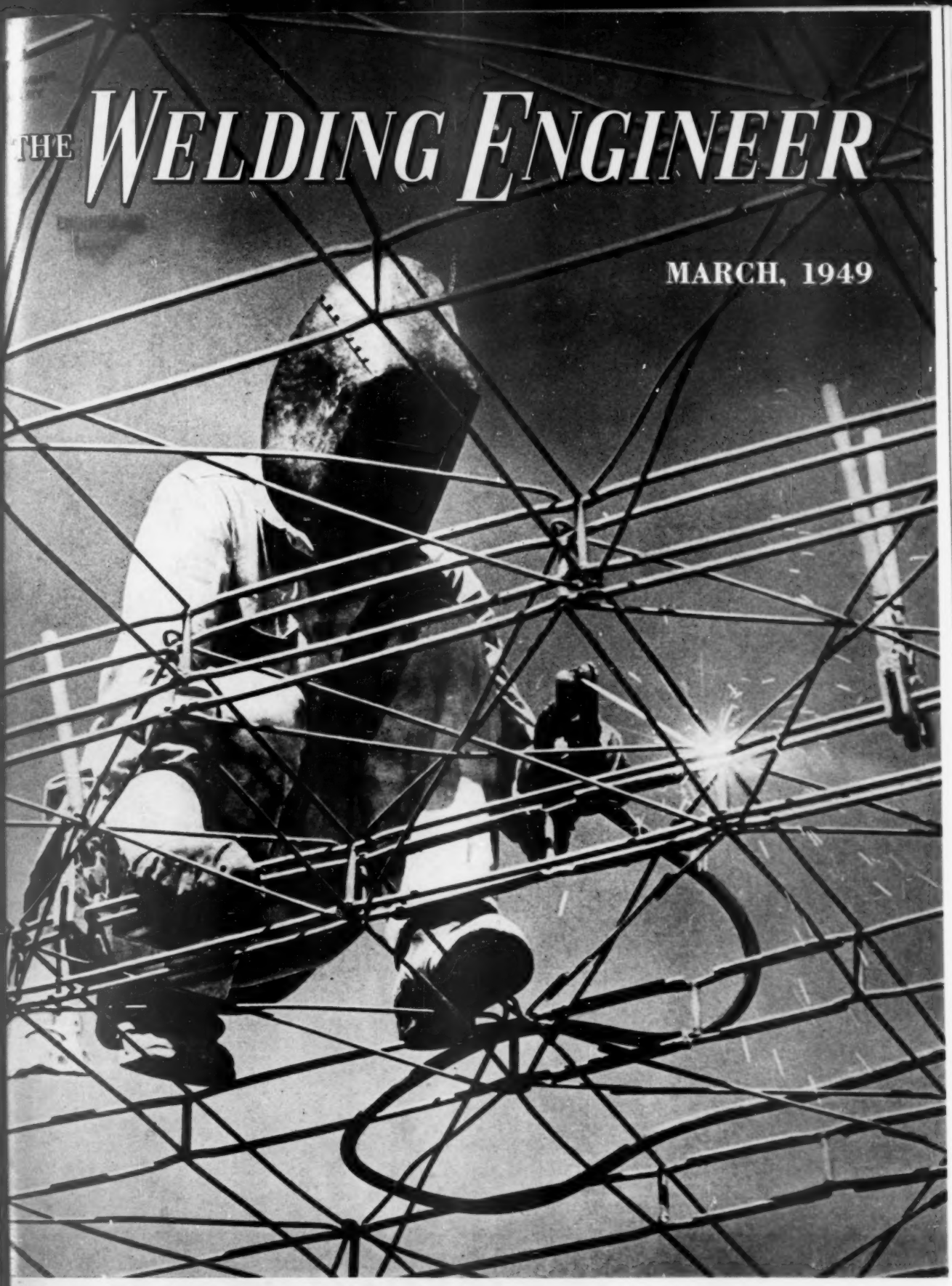
THE WELDING ENGINEER

MARCH, 1949



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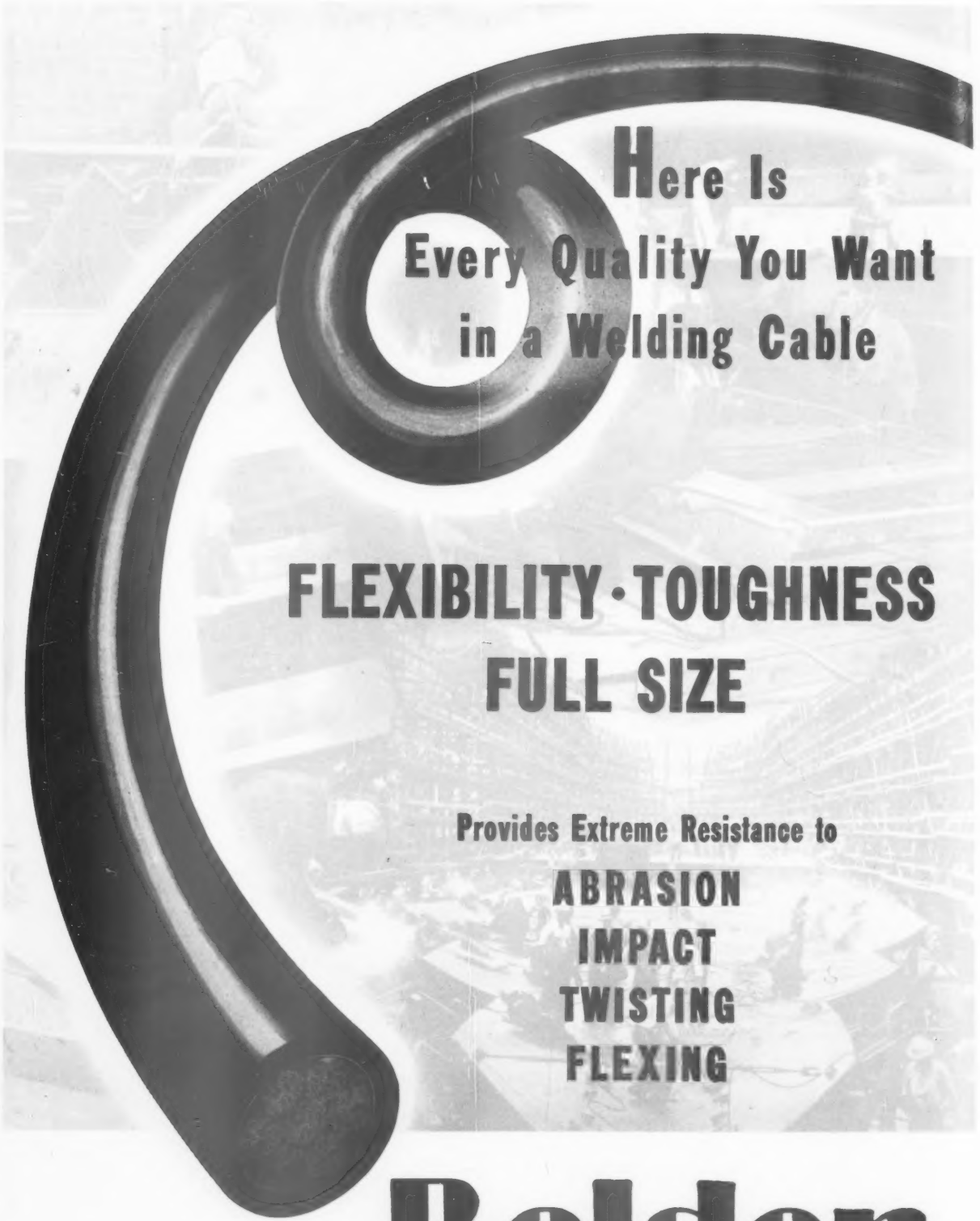

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Why Don't We Build Cheaper Homes?

INDUSTRIAL PRODUCTION has made us great. Without it, we would not enjoy the higher living standards that we who live in America have learned to take for granted. Welding has contributed in no small measure to the mass-production methods of modern industry, either to make the actual products turned out by mass-production methods or in the fabrication and maintenance of the machines by which those products are made.

As one example, let's look at the contributions of welding to that greatest of all mass-production items, the automobile. On the average car, the amount of welding done amounts to less than $25, including both labor and material, but it is estimated to reduce the cost of the car by $1,000. This, of course, is only one of the savings the automobile industry has brought about by its modern methods of mass production.

It's hard for us to believe that back in 1910 you could buy a five-room frame house with the same money you needed to buy a car. In that far away pre-World War I era, the average home was priced at $1,600; the average car at $1,584.

Today the cost of the modest home has jumped considerably. The house that once cost $1,600 can't be bought today for under $9,000, and you may have to pay a good deal more than that. Autos, too, have skyrocketed—or have they?

It is something of a shock to learn that in spite of all the extortions of the barons of the used car lots the average retail price of a new car in 1948 was only $1,714. The average house has increased by 460% in the past 38 years; the average auto by about 10%.

One explanation is that the home of today includes a modern heating plant, electric or gas range, electric refrigerator, tiled showerbath, porcelain tub, wash bowl and other sanitary facilities, built-in ventilating or air conditioning and many other conveniences that the home of 1910 did not have. Since we want to live more luxuriously, naturally we will have to pay for it. All this is true, but—

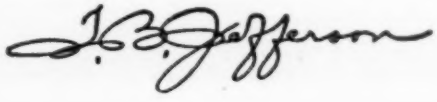
The modern automobile now has an all-enclosed steel body, glass windows, electric starter, battery, electric lights, radio, heater, windshield wiper and many other gadgets that weren't even dreamed of when the model of 1910 was the latest thing on the road. As far as improvements are concerned, it has kept pace with the home step by step. Yet it has gone up only 10% in cost, the home 460%. Why?

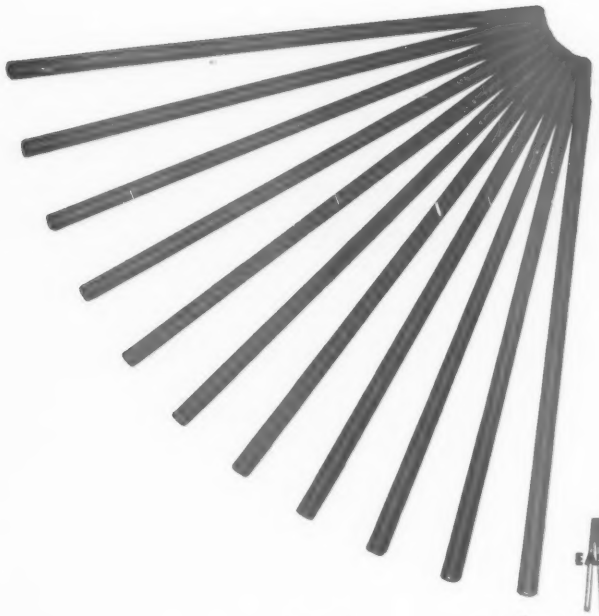
Mass production offers a big part of the answer. In 1910 both automobiles and homes were built mostly with cheap labor and hand tools. The pioneers of the auto industry were quick to realize that machine tools would make it possible to build more automobiles at lower prices. Lower prices would increase the demand for automobiles, which could then be built at still lower prices and so on. It worked out just about that way for a long, long time. So tremendous were the savings achieved in production that in spite of the enormous increases in materials and labor during the last few years, the average car is very little higher than the one of 1910. If hand tools were still used, today's automobile would cost about $60,000 to build, the American Association of Automobile Manufacturers estimates.

In contrast, the makers of homes never learned the above lesson. Today's houses are still built with the hammer, the saw, the plane, the bricklayer's hod and the other hand tools that were used in 1910. Very little new has been added except big prices for labor.

It is, we admit, somewhat difficult to adapt mass-production methods to house construction, but mechanized tools could be used to a large extent. The power saw, spray gun, welding flame and other production tools have a place in homebuilding and should be used extensively.

Odd as it may seem, there are whole industries that still refuse to accept the proved savings resulting from modern production methods. Some backward people are reluctant even to accept welding and its allied processes. Such stone-age conservatism has no place in the modern engineering world of today.





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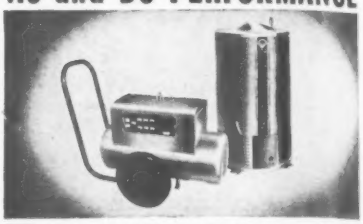

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ACCESSORY DIVIDENDS DECLARED

UNDERSCORING the importance of proper accessories to top welding performance, more and more fabricators are taking pains with selection of accessories. Speedier, lower cost, safer and improved welding are assured when such items as helmets, shields, holders, connectors, cleaning tools and protective clothing are carefully selected. And more and more fabricators—sold on M & T electrode and arc welder performance — are specifying the M & T line of "accessories to the perfect weld." For descriptive literature, address Metal and Thermit Corporation, 120 Broadway, New York 5, N. Y.

[Advertisement]

1—WATER INLET TOWERS at Lake Mead. From this quartet of towers the water runs into the penstock

2—GIANT HOOVER DAM from its lower side. Water drops about 500 ft to the hydro-electric powerhouse

HOOVER DAM

Turbines Kept Turning

Under pressure of a 500-ft head of water, cavitation rapidly eats away the surfaces of turbine runners and wicket gates. Maintenance requires application of stainless-steel inlays at preselected areas

BY FRED M. BURT

PRINCIPAL source of the power distributed by the Department of Water and Power of the City of Los Angeles is the hydro-electric generating system at Hoover Dam. Out of 4,000,000,000 kwh distributed during the last fiscal year, more than 2,500,000,000 kwh were generated at Hoover Dam. Though owned by the United States Government, the Hoover power plant is jointly operated by the L. A. Department of Water and Power and by the Southern California Edison Company, Ltd., under agency agreements. The bulk of the power generated goes to Los Angeles, though smaller quantities are supplied to the cities of Burbank, Glendale and Pasadena and to the states of Arizona and Nevada.

From the huge volume of water impounded in Lake Mead back of Hoover Dam (Fig. 1), water is fed through penstocks to the lower level on the other side of the dam, where the turbines are located (Fig. 2). Huge shafts run vertically upwards from the turbine runners to the generators. There are 12 generators of 115,000-hp capacity and one of 55,000 hp. Nine of these giant electricity producers are operated by the Department of Water and Power.

WHY RUNNERS WEAR

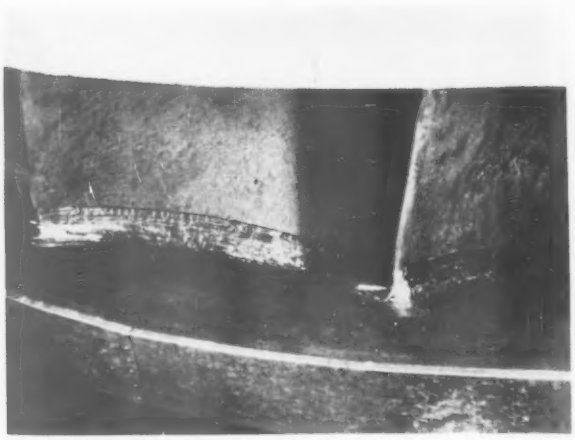
Between the scroll cases and runners of the hydraulic turbines, water is admitted to react on the vanes of the turbine runners and impart the pressure needed to revolve the big turbines. The runners develop 115,000 brake horsepower at approximately 2,500 cu ft per second under a 500-ft head. It is not difficult to see that they are in for serious trouble.

Continual dropping of water will wear away not only a stone, as a Roman poet first observed, but even hardest steel. Cavitation, the technical term for pitting and loss of metal on the runners was a factor that had to be reckoned with from the earliest days of plant operation.

The runners (Fig. 3) are cast-steel units of large proportions, being approximately 15½ ft in diameter and weighing about 75,000 lb. The inside diameter at the top of the draft tube is 11 ft, allowing ample space for working if the stub shaft is removed. The 19 vanes on the draft tube side are about 39 in. high and 1 in. thick on the trailing edge.

Maintenance of the hydraulic turbine runners began as long ago as 1938 by the general plant division shops personnel. At the start of this maintenance work in 1938 and for several years thereafter the chipping and arc-welding techniques develop-

3—SPARE TURBINE RUNNER in the shop to receive stainless-steel inlays on areas subject to cavitation



4—CHIPPED AREAS at base of runner vanes will be inlaid with weld deposit ⅛-in. thick after grinding

ed for the replacement of the lost metal were carefully checked and recorded. This valuable data was put together in a prize-winning paper written by Eric F. Bladholm, mechanical engineering associate in the general plant division. Mr. Bladholm's paper was included in the book *Maintenance Arc Welding* published by The James F. Lincoln Arc Welding Foundation. Some of the facts given in it will be used as background for the present-day operations described.

After unit N-2 had been placed in service in October, 1936, periodic turbine inspections disclosed cavitation damage. After four to six months of operation, pitting had progressed only to a minor extent in the low pressure areas of the vanes near the trailing edge. The pitted areas were small with maximum depth only about 1/16th of an inch. During this time, the head on the turbines had increased from approximately 378 to 450 ft.

First Repair Program

After about 16 months, service inspection showed that pitting had advanced seriously. So fast was cavitation progressing that it bore out the generally accepted theory that discontinuity or roughness of surface increases the intensity or activity of cavitation. It was necessary to plan an extensive repair program for the coming low-peak season.

Cavitated metal was removed by chipping. A milling method was also developed for removing the metal and proved very successful. Electrodes of mild steel, 18-8 stainless and 4-6 chromium were all tested in an effort to find out which deposit was most suitable in all respects. Bonding and depositing characteristics were also determined. Test plates were made to aid in developing the best repair methods. These plates were set in vertical positions to simulate actual field conditions. Different chipping methods and tools were tried out. Current and potential settings were noted for the various electrodes. Deposited weld metal was peened and then ground in order to determine both the grinding characteristics of the metal and the best types of grinding wheels and tools for resurfacing.

Stainless Found Best

Stainless-steel resurfacing, although costing a little more, was found to give about five times as much service as mild steel for a comparable amount of pitting. The finished vanes conformed more accurately to correct contour than the original castings. The surface was smoother and more dense, also free from sand holes and porosity. The result of installing the welded runners was an increase in output of approximately 4% over the horsepower obtained prior to welding repairs.

From the carefully compiled experience records, all of the areas on the runners subject to cavitation have been mapped. As a preventive maintenance treatment, spare runners (Fig. 3) have these areas laid out and chipped to a uniform depth. A stainless-steel layer is then deposited over these areas of weakness, a layer that will have a ⅛-in. depth after being ground to a uniform smoothness (Fig. 4). Between 20,000 and 25,000 sq in. of overlapping stainless-steel beads are deposited on the vanes and other parts of the runners subject to cavitation. This is slow and very careful work, for any extra thickness of deposit will necessitate an excessive amount of grinding. Beads must also be properly overlapped to reduce to a minimum the valleys to be filled after grinding.

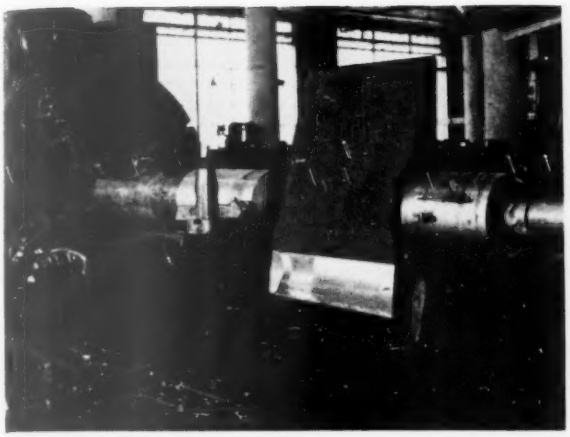
The obtaining of a proper quality of welding in the shop presents no problem. The 13 certified weldors employed at this work are all top-grade men, each being qualified to the highest standards for welding on pressure vessels of unlimited temperature and unlimited pressure.

Since all of the original runners have been resurfaced in cavitation areas, and spare runners are similarly treated before being put into use, the cost of expensive replacements has been eliminated. The runners now operate almost interminably without repairs.

Wicket Gates Erode, Too

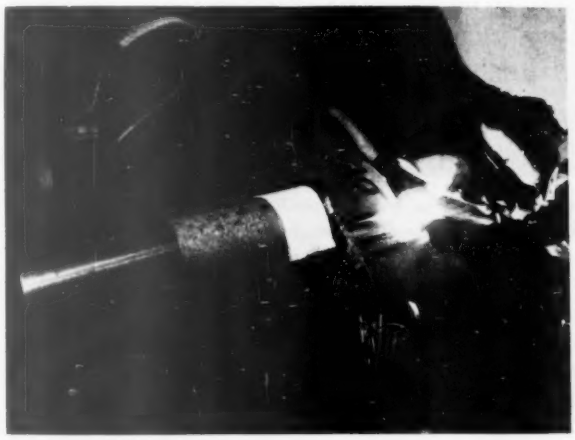
The same techniques of applying a stainless-steel surfacing have been applied to the wicket gates and their shafts. The wicket gates, it should perhaps be explained, control the volume of water allowed to react on the vanes of the turbine runners and hence are subject to the same eroding action of water at high pressure.

As with the turbine runners, the



5—WICKET GATE is machined in enormous lathe to prepare it for inlaying. Note milled area on gate heel

6—VARIABLE-SPEED JIG turns wicket-gate shaft at 4 rpm. Long upper end of shaft is in pit under floor



7—FACING HEEL of wicket gate. An area 5 in. wide is covered. Note inlay already applied to the shaft

8—POLISHING BEARING and packing gland areas of wicket-gate shaft after machining inlays to diameter

areas which experience has determined may be subject to cavitation are stained and laid out as a guide to further operations. Before removing the metal by machining, the gates are checked for alignment. The toe seating surface is milled out with one set-up on a milling machine, and the toe is machined with another set-up. A 19-in.-long portion of the longer 8-in.-diameter journal or stem is turned on a big lathe; a 10-in. length on the short stem (Fig. 5) is likewise machined.

While a variable-speed drive rotates the shafts at about four rpm, the weld is built up with an inlay of 18-8 stainless steel. When the upper journal is being welded, the long upper end of the shaft is contained in a pit in the floor (Fig. 6). The end product reveals a great expertness on the part of the weldor, who deposits an inlay of surprisingly even thickness, complete coverage and freedom from valleys that would require subsequent fill in.

The gates are next placed in another fixture for application of the 18-8 weld metal on the heel and toe seating surfaces (Fig. 7), and other small areas are stained and laid out as previously explained.

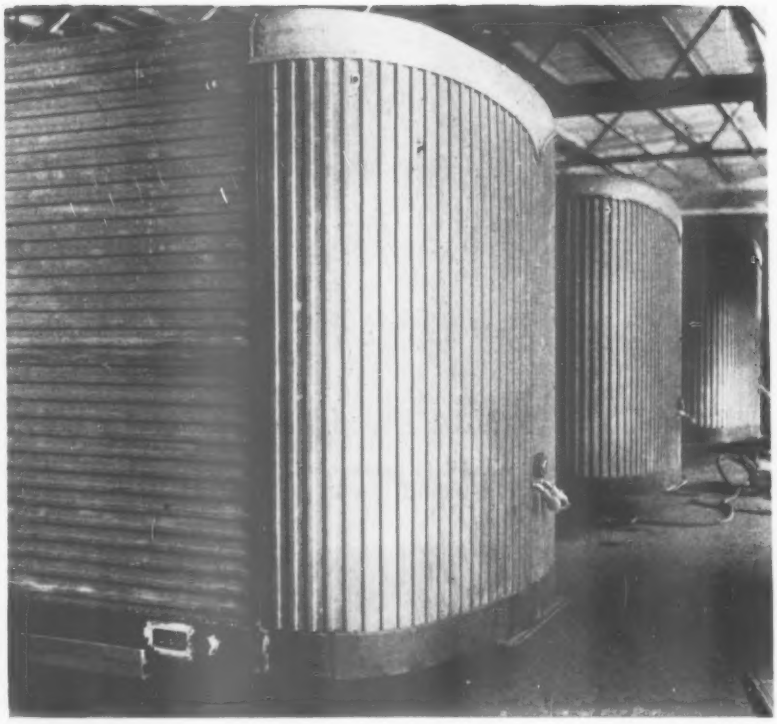
Postweld Finishing

The built-up surfaces on the gate are accurately machined after welding. The shaft is precision machined to the proper diameter and then polished to a high finish (Fig. 8). The stainless-steel inlay is highly resistant to both erosion and corrosion. Its application adds substantially to a gate's years of service, and the operation of resurfacing can be repeated as many times as necessary.

This part of the maintenance program was started nearly two years ago on a set of 24 gates, which were rendered ready for service previous to general overhaul of one of the big hydraulic units. The set of gates removed from that unit was in turn renovated by welding and used in the next unit overhauled, and so on. The set pictured in the accompanying illustrations is the third unit of 24 gates. At the present writing, not even the first set has been in use long enough to determine the added life given to gates by the stainless-steel inlay, but experience with the turbine runners leads to good expectations.

The writer is indebted to Clayton M. Allen, engineer in charge of the general plant division; Frank R. Gould, shops superintendent, and his assistant, E. J. Bowe, for their fine coöperation in supplying the information for this article.

BY GERALD ELDRIDGE STEDMAN



FRONT ENDS of vans after assembly and installation to bodies. Placed on dollies, the van bodies travel on rails down the final assembly line (page 37)

Vans Welded on A

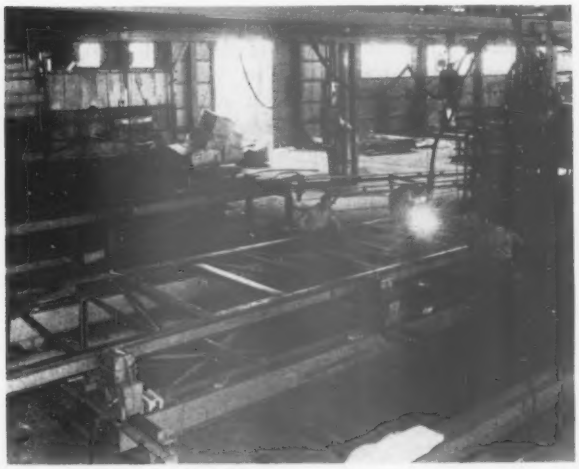
Steel Products Co., Inc., Savannah, Ga., has pioneered all-welded construction in vans and flat-bed trailers. Both resistance and arc welding are utilized to build vans, which may be as long as 36 feet

TECHNIQUES of all-welded construction in van bodies, tank and flat-bed trailers are well advanced at the Steel Products Co., Inc., Savannah, Ga. This company builds the "Great Dane" transport trailers, extensively used in long-haul truck transportation along the Eastern seaboard. Van body production is in flow sequence on a production line, automatically timed to produce three units per day. Considering that overall lengths range up to 36 ft 6 in., this certainly can be called mass-production. In my 990 plant visits, I have nowhere found a more efficient welding production line.

THE MEN BEHIND IT

George A. Mercer, Jr., president; Christopher Hammond, Jr., vice-president and general manager; J. C. Cheshire, plant superintendent, C. A. Inglesby, chief engineer and manager of structural department, and R. A. Jewell, master mechanic, are an ingenious and inventive group who have established innovations in management, engineering tooling and shop practice.

Practically everyone in any command at Steel Products Co. has two titles, indicating the extent of the doubling up. From the technological standpoint, the near-automatic line flow for all-welded construction of van bodies was accomplished because of the urge to reduce the break-even point and to achieve a



1—PRODUCTION STARTS with welding of side frame on this 30 by 10 ft jig before sheets are tack welded

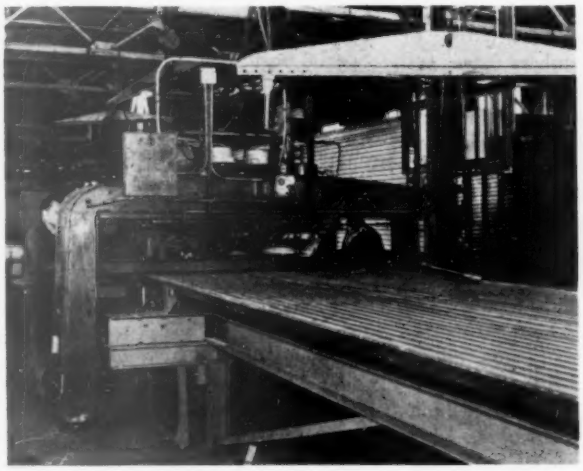
2—SEAM WELDING side sheets together. The hydraulic hold-downs travel on rollers down the corrugations

FINAL ASSEMBLY embodies installation of lights, wiring, rear doors, flooring, hardware, insulation, ventilators, ice bunkers, ice hatches and side and sleeper doors. Also added are axles, springs, landing gear, tires, tire carriers

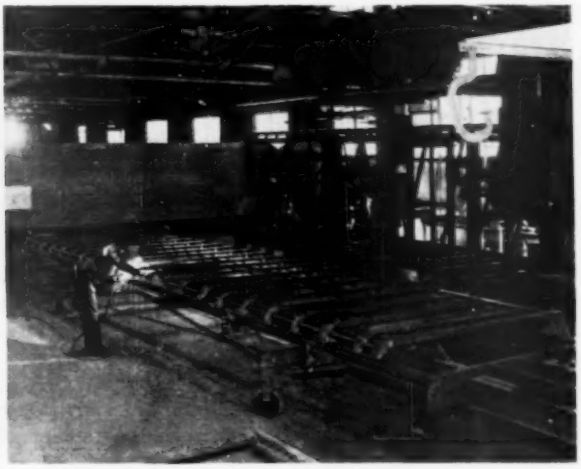
n Assembly Line

better product. It was spun from the fundamental ideas of J. C. Cheshire, capably detailed by Engineering and built in the company shops.

Steel Products payroll tends now to stabilize around 300 employes. Organized labor relations are very good-natured. Work is under an incentive system called a "production bonus plan." This divides the year into 13 four-week periods, establishes break-even points in period production, distributes periodical bonuses above break-even points among all employes, excluding officers, in proportion to wages earned in relation to total payroll. Daily shop production standings in rela-



3—SHEETS AND FRAME are welded together in this fixture, which is also employed for the roof assembly



4—ROOF FRAME is assembled on jig in foreground and wheeled to seam-welder table to receive cover sheet

tion to break-even are visualized on a large display board. Everyone pushes to get the indicator into bonus pickings. Turnover is less than 5% per year, and absenteeism has been less than 2% over the past six months; indeed, this production bonus plan seems to be the certain corrective of absenteeism. The plant's supervisional ratio is one to 15. Accident frequency is 38.5 per 1,000,000 man-hours. Housekeeping is excellent. Scrap losses are less than 0.05%.

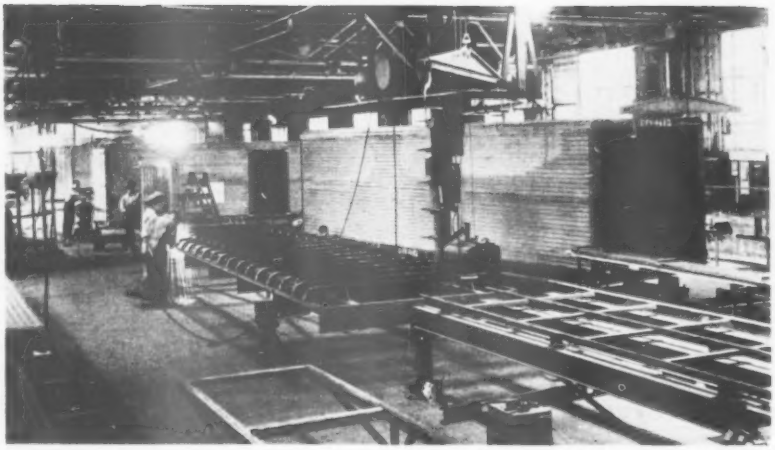
The labor rate averaged 53c per hour before the last war, has now more than doubled. This and advancing material costs created heavy penalties to profits. It was vital in 1946-47 to cut back costs some 70%. This necessitated technological improvements in production, bonus incentives for greater man-hour efficiency and much doubling up of supervisional function, through all of which the break-even point was materially reduced. Present labor costs are now the same as before the war, and the plant is building a much better product.

Plant and Equipment

Company plants cover eight acres. Steel is received in plate and sheet sizes for storage in a 60 by 200 ft outside area served by railroad spur. Two Central of Georgia sidings run into the plant.

Varied rolls, press brakes, angle shears and other equipment essential to fabrication of structurals for van bodies are arranged in good layout in an inside structural bay, 80 ft long and served by a 40-ft craneway. There are three 10-ton overhead craneways serving plant and yard. All cross members, longitudinal rails, hat (flanged channel) sections, box and regular channels are prepared to size and racked or binned at proper stations along welding and assembly lines. Parts storage is never more than ten feet from use, resulting in very little materials handling. Flow is from sub-subassembly into final assembly on a ten-station line.

The 80 by 160 ft sheet-metal department is just ahead of the welding bay. It forms, corrugates and delivers sections to racks facing the welding department. The latter covers an area 100 by 100 ft.



5—CORRUGATED VAN in final assembly jig is finished and awaits the installation of front. Roof frame is ready to receive the cover sheet, which will be tacked to it with the portable welding gun shown in the upper left corner

Both arc and resistance welding are used, the latter mainly to tack and seam weld corrugated wrapping sheets. Steel Products has pioneered frameless, all-welded construction in both vans and flat-bed trailers, eliminating in the latter the usual central "spinal column" formerly employed to give longitudinal strength. In the van body, side walls act as trusses to contribute requisite stiffness to bottom rails. The open truss, applying the bridge-truss principle, accomplishes a like purpose in flat-bed trailer design.

Van Construction

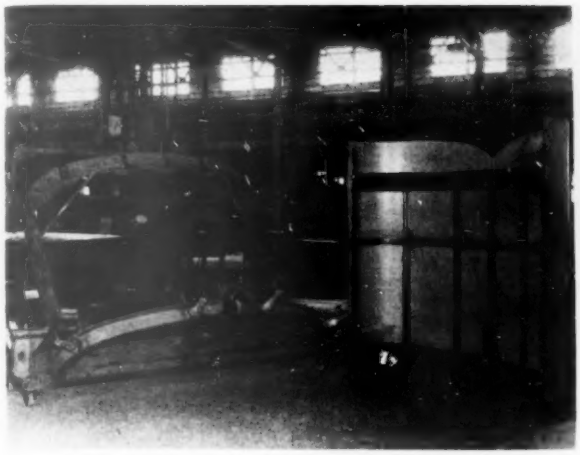
Bottom construction of the van body is an arc-welded assembly which employs airplane-type box channel cross members, punched out along a neutral axis to provide lighter weight without loss of strength. Cross members have mechanical support from the side rails, to which they are solidly welded. Heavy steel channels are welded to cross members to give full support to running gear. The rugged upper fifth wheel with its chrome-molybdenum steel kingpin is arc welded into extra-heavy I-beam; wheel plate, landing gear and running gear channels are mounted on structural channel cross members for added strength.

Sides and top of the van are built as separate panels before assembly and welding. Interesting design eliminates moldings. Uprights and top cross members are formed of hat sections. Body wrapper is of corrugated sheets of steel, which run continuously from the bottom side rail over the top to the opposite side rail. Side sheets are corrugated for extra strength and spot welded to upright members. Corrugated curved sections at eaves protect against denting. All longitudinal joints in corrugated sheets are welded into one solid waterproof unit. The van body is a splendid example of the many structural and functional advantages inherent in all-welded construction.

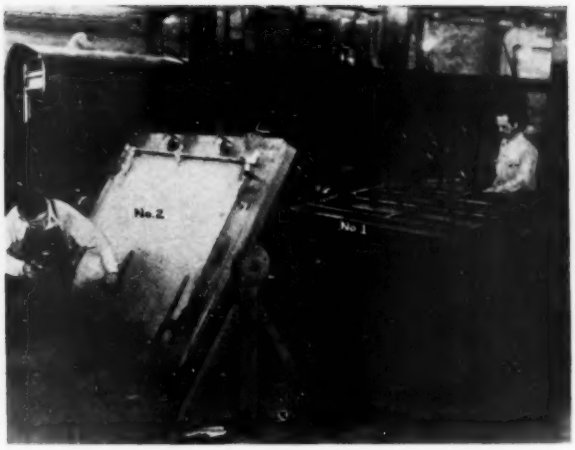
Building of side frames is one of the first operations in van assembly. The frame assembly jig (Fig. 1) is 30 by 10 ft and can take any length from 20 ft to 36 ft 6 in. Structural members are of high-tensile steel. They are racked by the side of the jig for convenience and dropped into position to be clamped by air clamps operating at a pressure of 90 psi. Special positioners enable all welding to be done downhand. Welding is a combination of arc and spot on each side.

Side-Frame Sheets

The corrugated sheets carry 1¼-in. square-cornered corrugations with ½-in. rise. Lengths of from 3 to 12 ft are delivered to the seam-welding tables. Two 30 by 8 ft tables are utilized, the work flowing from the first to the second table by means of power-driven rollers. The tables are also equipped with pneumatic hold-down rollers (Fig. 2), two of which travel in the corrugated



6—JIG FOR FRONT assembly with van front ready for insulation. Jig is counterbalanced to allow it to be turned in most convenient position for fabricating round fronts



7—COMBINATION JIGS for rear and side doors. No. 1 is for assembling and welding door frames; No. 2 for assembling hinges and miscellaneous door hardware

trough to hold the sheet steady for welding of the longitudinal seam. From six to 12 sheets are involved in body construction, nine sheets on a 30-ft side. After the corrugated sheet has been seam welded by a 200-kva welder, it comes to the second table, where it is tack welded to the frame by monorail-mounted portable spot welders.

Finish welding of sheets to side and roof frame components is accomplished by an automatic seam welder. The assembly fixture (Fig. 3) is on a track, and the work is moved transversely to the table. Uprights are fitted into slots in the table in line for weld; 60 electronically controlled welds per foot stitch side and top sheets to the frame. This finish-weld fixture has two 30 by 10 ft tables, between which the welder is straddle-mounted. The table carriage has an 18-in. movement. Holding fixtures are reversible to give back-forth direction of movement. Work is anchored in slots and aligned automatically.

Roof Assembly

The roof frame assembly jig (Fig. 4) is mounted on castors that enable it to be moved against the seam-welder table to receive the welded cover sheet. After the sheet has been slipped onto the roof frame, it is tack welded with the portable spot welder shown in the upper left-hand corner of Fig. 5. Jig and roof are again moved back in line by an electric hoist with overhead balance beams and placed on the automatic welder table shown in Fig. 3. Cross beams are then mashed down by an air hammer, and the roof is moved off the automatic welding table to the soldering jig. In this technique, all longitudinal seams are seam welded; all cross seams are spot welded; the entire mating is soldered.

The final weld-assembly jig (Figs. 4 and 5) mates sides, bottom cross members and roofs. First, the bottom cross members are placed in it and locked by air-clamped holding fixtures. Next sides are installed and clamped in place. Finally, an electric hoist, using balance beams and hooks, drops the roof into position. Sides, bottom and roof are arc welded together, using a current of 200 to 400 amp.

The van body is now moved onto dollies, and openings for the wheel housings are flame-cut. The van front has been previously subassembled on its own jig (Fig. 6); it is added to the rest of the van.

Traveling by rail on the wheeled dollies, the body now takes its place on final assembly line, which has ten stations. At these varied stations, the body receives undercarriage installation, brake lining and wiring, floors, body lining and insulation, installation of special services and finally comes to the paint shop, off the line. Each station breaks down the assembly, and specialized gangs work along line flow. Special design jigs accommodate odd production. Subassembly jigs off the line take care of doors, ventilators, roof caps. An idea of this subassembly work may be gleaned from Fig. 7. In this picture, jig No. 1 is for assembling and welding door frames and jig No. 2 for assembling hinges and miscellaneous door hardware.

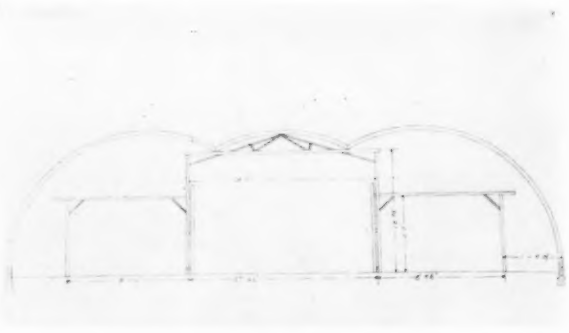
Tank Trailer Department

In the 40 by 425 ft tank trailer department, all work is specialized. None conforms to line production. Welding machines are platformed aloft out of the way. This department is served by numerous swing cranes. I noticed a hydraulic roof-bow forming machine, designed by Master Mechanic Jewell, in which air pressure is used for hold-down and hydraulic pressure to throw the bow up to form.

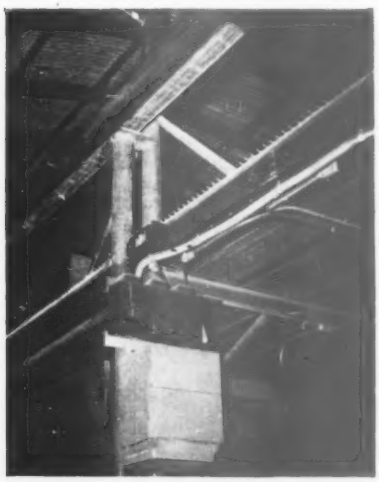
On tanks involving Code welding, certified weldors are employed and procedure is standard. AWS E-7010 electrodes are used on high-tensile work, and AWS E-6010 and E-6012 electrodes are standard elsewhere.

Superintendent Cheshire's office has a picture window overlooking the welding bay and final assembly flow. He uses a production control system. Copies of prints are furnished to all departments concerned on all jobs, and their production timing meets the line flow. Production control and sales are in excellent liaison. Perpetual inventory control is also unusually precise. In fact, the company's bonus plan requires precision and close control in all details in order to award bonuses properly as earned.

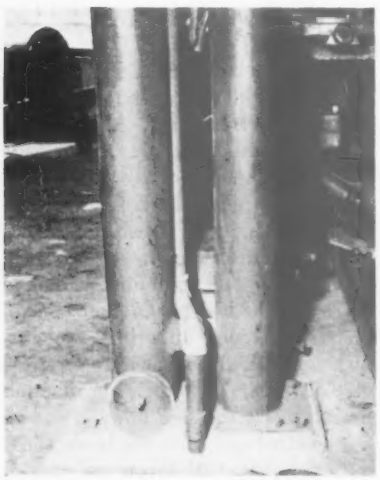
1—FORSYTH ENGINEERING building, Houston, was formed by combining two Quonsets into one structure



2—FRAMEWORK of building consists of 5-in. tubing used as columns, longitudinals and transverse members



4—CRANEWAY supports were also 5-in. pipes and were tied into the air storage system. A space heater is suspended on the twin posts



6—DRAINAGE plug (inside circle) at base of one of a pair of twin columns along the center bay. Use of pipe plug indicates need for drainage must be infrequent here

Air Stored in B

The idea is as simple as it is ingenious: the building ribs store compressed air. The hollow tubular framework provides a storage capacity of 470 cu ft—three times normal for a shop of this size

BY ELTON STERRETT

COMPRESSED AIR is one of the essential aids around the modern machine shop. It serves to power small drills, hand tools, grinders, hoists, jets for blowing chips, is used to furnish blasts for heating and annealing furnaces and for powering such devices as metallizing guns.

One engineering and specialized machine shop, the Forsyth Engineering Co., Houston, Texas, provides compressed air for these manifold needs without having to lay piping or string hoses. The idea is as simple as it is ingenious: the building ribs serve as storage space.

It is necessary to understand the nature of this particular building. The structure (Fig. 1) was formed by mating two Quonset buildings of 20-ft radius to give an outside span of 82 ft 4¾ in. at the foundation line. There are two side bays having a 12-ft clearance and a central section 18 ft 6 in. under the roof beam. All of this is supported on 5-in. tubing—the building "ribs"—instead of the conventional I-beam or channel structural shapes. The only structural shapes in the building are the I-beam rafters formed to the 20-ft radius to carry the roof.

The heavy-walled tubing supports are joined into transverse bents or frames as shown in Fig. 2. All of the welds had to be made to pressure specifications, and the pipe wall included within welds was cut out to allow clear channels for air. The longitudinal members, welded in at each right-angled intersection of the 5-in. transverse and upright members as shown in Fig. 3, were also provided with cleared areas within the welds. Thus the building framework consists entirely of a single system of piping, welded at each junction. This three-dimensional latticework gives an air storage space computed to hold approximately 470 cu ft. Converted to dimensions of standard air receivers, this capacity is about that of a cylindrical receiver 26 ft high and 54 in. in diameter. It is well over three times the air storage capacity normally provided for a shop of commensurate size.

The craneway is also supported on 5-in. pipe. The posts or columns which carry the steel beams on which are welded the craneway rails (Fig. 4) are mounted on a common base with the longer or center-section uprights of the building framework. Since these columns are not tied together at the top other than by welds to the craneway beams, 2-in. connectors are welded between pairs of

3—LONGITUDINAL and transverse pipes were welded to columns so as to maintain air flow through members

5—COLUMN BRACING, 2-in. pipe, did not penetrate 5-in. piping and was not made part of the air storage

n Building Framework

columns some 6 in. above the floor. These tie-ins serve to carry air to the craneway columns and thus add their storage capacity to that of the building framework proper. The paired columns are also tied together at intervals up to the 12-ft height by webs welded between the two pipes. Flat steel is used instead of pipe for this reinforcing on account of the greater ease of making the connecting welds.

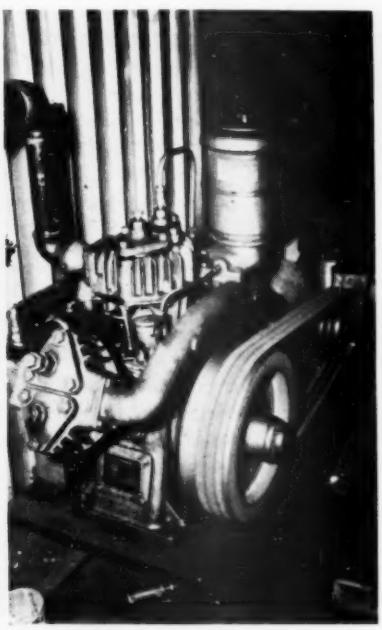
Two-inch extra-heavy pipe is used for column braces (Fig. 5) and to make the supplemental roof truss which carries the center of the building. This 2-in. pipe is welded to the outside of the 5-in. pipe without penetration to the interior. No attempt was made to include the braces in the air-carrying structure.

Each pipe column in the outer rows of the frame is equipped with means for draining off condensation, while one drain suffices for each pair along the central bay. The drain is formed by flame-cutting a small opening near the base of the column and welding in a pipe collar or coupling. A valve, stopcock or plug set into the collar provides for draining off liquid accumulations.

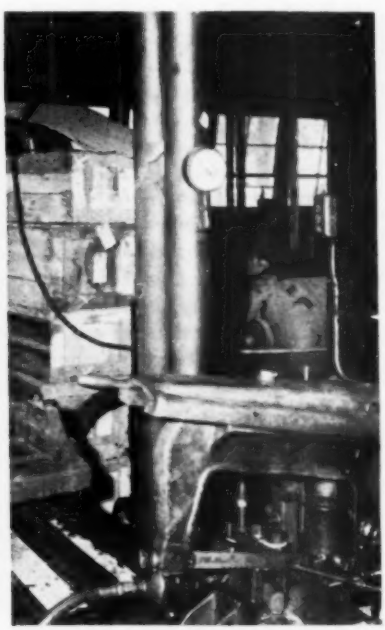
After putting the compressor into service, tests were made at the various drain points. It was found that the columns nearest to the compressor could be kept clear by opening their drains once each month. Columns farther away could be left

(*Continued on page 45*)

7—AIR OUTLET is tapped into post adjacent to the machine bay. Valve is on side away from material handling to prevent any damage



8—MOTOR-DRIVEN compressor of 61 cfm capacity needs to operate only a part of the time in order to provide air for entire shop



9—PRESSURE GAUGE is mounted on a post behind the cut-off saw. It may be easily read without any climbing up to the air compressor

Tungsten:

To Save or Not to Save

BY R. W. TUTHILL
Welding Equipment Div., General Electric Co.

Are we justified economically in protecting the tungsten electrode used in inert-arc welding against the ravages of oxidation when the extra argon consumed costs six times as much as the tungsten saved?

ONE OF the first questions asked about inert-arc welding is, "What is the tungsten consumption?" The answer usually implies that the consumption is so small it can be neglected. This statement should be qualified because tungsten consumption can be excessive and may cause rejection of welds.

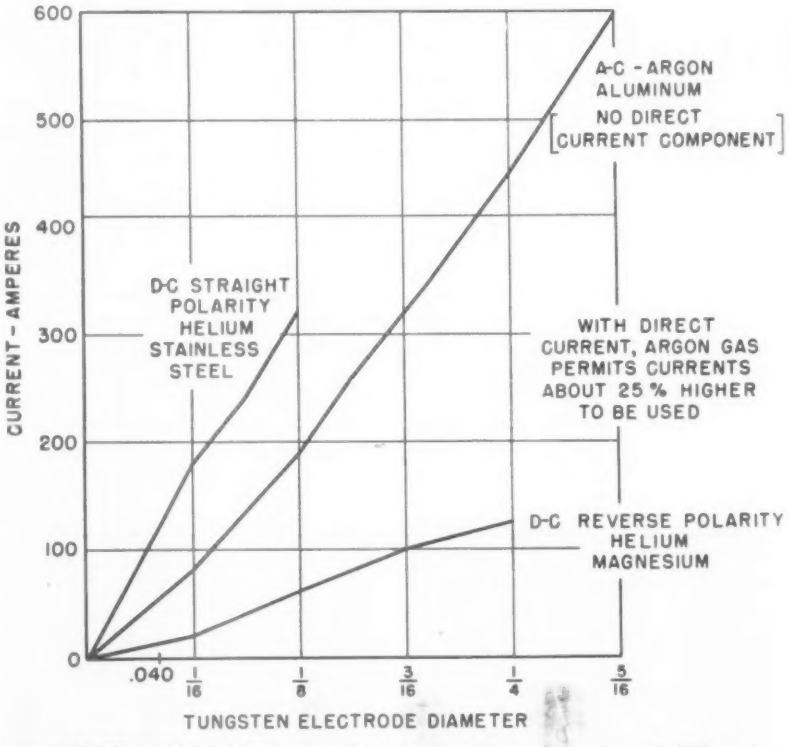
There are two primary factors involved. The first is the cost to the user of the consumed tungsten, a cost somewhat similar to the cost of tungsten electrodes in atomic-hydrogen welding or to the cost of carbon electrodes in carbon-arc welding. (This cost may be considerable since tungsten electrodes, in 4-in. lengths, are priced from 4 to 35 cents per inch, depending on the size.)

The second and more important factor is what happens to the tungsten that is used. Does it go up in smoke, or is it deposited in the weld? If the latter, what effect does it have upon the weld?

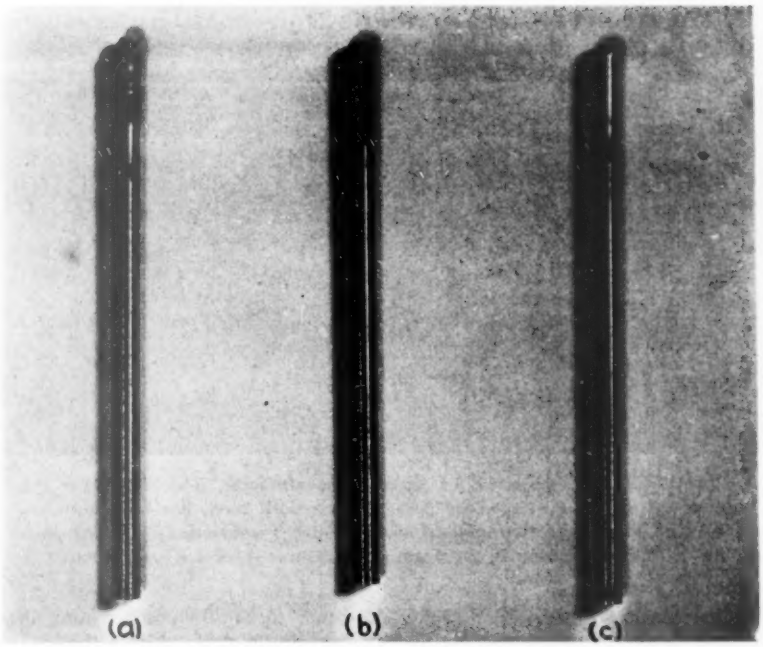
In many applications, moderate tungsten deposits in the weld-metal may not be detrimental. Unfortunately, the full effect of deposited tungsten on weld strength, corrosion resistance or resistance to impact is not known at the present time. Because these factors are not known, many large pressure vessels are being X-rayed to show up inclusions in the metal as well as cracks and porosity. The inclusions usually encountered are tungsten. Because their effect on the weld is not fully understood, the metal in question is usually chipped out and rewelded. Needless to say, this is very costly and, in most operations, will far outweigh the cost of the tungsten itself.

For some types of welding, moderate tungsten inclusions can be tolerated. In the majority of applications, however, the inclusions usually are removed if there is any question concerning the effect on the quality of the weldment.

In welding aluminum, a cardinal principle of operation is that the tungsten electrode must never touch the molten aluminum. This can happen if the tungsten is accidentally dipped into the pool or if the aluminum filler wire is pushed into the arc so rapidly that it does not melt quickly but comes in contact with the electrode. The tungsten electrode is very hot during welding, at least 6,200 F on the tip. The aluminum which strikes this area of high temperature seems to vaporize and disrupt the arc so as to cause sputtering and result in a black splotch on the work. The arc will continue to sputter until all aluminum has left the vicinity of the electrode tip. The aluminum must vaporize and be removed before the arc can become stable, and quite a bit of tungsten is lost during the process of cleaning up the aluminum. The lost tungsten is left in the work unless the arc is held on an auxiliary piece of aluminum or on a steel plate. Of course no tungsten is deposited in the weld metal if the end of the electrode is broken off to remove the portion with the aluminum on it, but this practice usually results in even more tungsten being lost.



2—CURRENT-CARRYING capacities for tungsten electrodes of different diameters are given by above graphs. Note the very much larger electrodes required with d-c reverse polarity. The a-c graph assumes that the d-c component resulting from high-frequency stabilization has been eliminated



1—TUNGSTEN ELECTRODES, 5/32 in., used for welding aluminum at 200 amp. (a) Dipped in aluminum while welding; (b) oxidized tip; (c) clean tip

Since the practiced weldor rarely makes a slip and contaminates the electrode, loss of tungsten in the shop by this means is not very large. In Fig. 1, (a) shows a 5/32-in. electrode which was dipped into the aluminum pool while welding with 200 amp.

Too High a Current

Another cause of tungsten loss is incorrect current density. If the current level is run too high, the tip of the electrode becomes quite molten, and the end is so fluid that it drips off during welding or at the end of the weld when the arc is extinguished by pulling the electrode violently away from the work. The obvious solution is the proper size electrode for the current being used. Graphs showing approximate current-carrying abilities for five different diameters of tungsten electrodes with a-c, d-c straight polarity and d-c reverse polarity are given in Fig. 2.

Some indication of electrode erosion has been noticed on d-c straight polarity when the current was too low. This erosion resulted in a "necking down" of the electrode above the arcing tip. The remedy seems to be to use a smaller electrode for the job, which, incidentally, should cause the arc to be more stable. On d-c reverse polarity, tungsten is lost very easily by overheating the electrode, and very much reduced current levels are necessary. The loss of tungsten from incorrect current, however, should not be severe in a shop where good welding practices are followed.

The method of starting the arc and proper gas coverage are items of great importance and usually are the major causes for excessive tungsten loss and tungsten contamination of the work.

In the early history of inert-arc welding of aluminum, arcs were started by striking the electrode to the work. This method resulted all too often in the aluminum sticking to the electrode with the bad results we have already noted. Introduction of the high-voltage, high-frequency pilot circuit rendered it unnecessary for the electrode to touch the work with power current flowing, and hence avoided contamination of the electrode with aluminum from this cause.

As the currents used on the new welding process climbed higher until 400, 500 or even 800 amperes are being used, another factor enters the picture. The size of tungsten for these higher welding currents is from 5/16 to ½ in. in diameter. When an arc is struck, the electrode is forced to conduct the full welding current almost immediately and, as a result of this excessive current flow while cold, some portion of the electrode may be lost. This loss can be minimized by starting the arc at a reduced current level and raising the current with a pneumatic device after the electrode is hot. Regardless of how much tungsten is lost, the amount deposited in the work may be reduced by starting the arc on an auxiliary scrap piece of aluminum and then transferring it to the work.

Oxidation of Tips

The major cause of high tungsten loss and large deposits of tungsten in the work is the oxidation of the electrode. The presence of tungsten oxide on the tip of an electrode (see (b) in Fig. 1) will cause the arc to be wild and cause considerable tungsten to be blasted off the end of the electrode into the molten pool. This blasting, otherwise known as "tungsten throw down," will occur on starting and may last for several seconds until all the oxide is removed. An electrode may become oxidized if it is allowed to cool from a previous weld in the absence or partial absence of the inert-gas shield.

A tungsten electrode will begin to oxidize at approximately 600 F. There are several kinds of tungsten oxide, and they have characteristic colors. Tungsten dioxide is brown and forms at low temperatures. Tungsten hemipentoxide is blue and forms at moderately high temperatures. Tungsten trioxide is yellow and forms when the electrode is incandescent. All these oxides form in the presence of air. There are many other oxides of tungsten, but these three are the major ones encountered in inert-arc welding.

If inadequate gas coverage results in a dirty weld, it is immediately apparent to even an amateur that something is wrong. Obviously, the gas flow must be increased until the weld is clean. Less well known, however, is that the gas flow must be continued after the arc is stopped to permit the electrode to cool until its temperature is below the oxidation stage. This extremely important item is very often neglected. Where water-cooled electrode holders are used, it

is good practice to keep the water flow on while the gas is on in order to hasten the cooling period and minimize gas consumption.

Gas flow may be required from 5 to 50 seconds after the arc is stopped. The required flow can be attained automatically if a time-delay shut-off is installed on the gas and water solenoid valves, which should be located in the inert-arc welding machine.

With Clean Electrodes

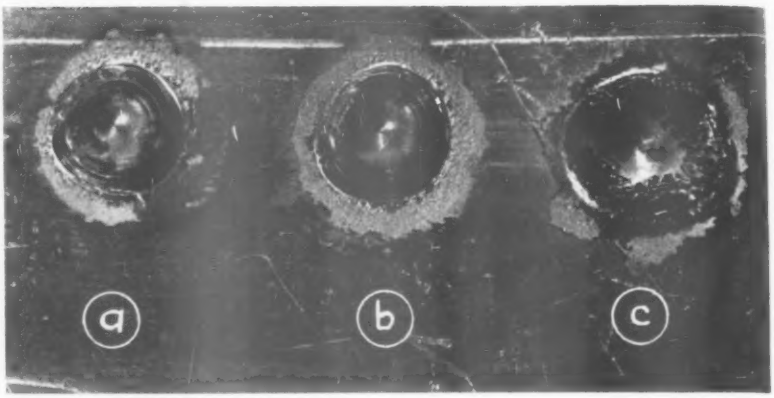
Tests were run on aluminum in argon using a-c with high-frequency pilot starting. Electrodes in the smaller sizes were tested up to $\frac{1}{4}$-in. diameter. The tests showed that an average loss of about 0.0005 in. in length is to be expected on a clean electrode at its normal current level if it is started cold. If the electrode is hot when the current is started, the loss is about 1/10 of this.

Though small, these losses are tangible. The tests indicate that the loss of tungsten during the actual running of the arc is about 0.004 in. per hour of continuous running at the proper current level for the particular electrode. Theoretically, one inch of tungsten will make a weld about 5 miles long, figuring a travel speed of 20 in. per minute and assuming continuous running. However, the tests also show a tremendous increase in both tungsten loss and tungsten deposit when the electrode has been previously oxidized by permitting it to cool slightly and then interrupting the inert-gas protection. The tungsten consumption per start seems to be about 0.010 to 0.015 in. or more, which is about equal to three hours of arc time and equal to thirty normal clean starts.

Tungsten inclusions will readily show up under X-rays. Fig. 3 shows a cold start with a clean, non-oxidized electrode (a), a hot start with a non-oxidized electrode (b) and a cold start with an oxidized electrode (c). This last start is the only one resulting in any inclusions. The tungsten deposited can be seen partially on the surface as black smut which cannot be brushed off. A radiograph of the X-rayed sample showing bead appearance is reproduced in Fig. 4.

Some tests indicate that even clean cold starts may cause considerable tungsten loss at very high currents. The reason has been suggested to be

Whenever tungsten oxide is present on the electrode tip.



3—SURFACE APPEARANCE of three types of starts (see Fig. 4 for the appearance of starts as seen by X-rays). (a) Cold start, non-oxidized electrode; (b) hot start, non-oxidized electrode; (c) cold start, oxidized electrode. The black smut in (c) is tungsten deposited on the weld surface.

similar to the action of damage to electron tubes by insufficient warm-up time. To avoid the loss, it may be necessary to start the arc at a lower current and then raise to welding current a few seconds afterwards.

It can be readily recognized that the tungsten loss and its deposit in the weld may vary considerably depending on factors such as operator technique, method of starting, current level, electrode size, etc. The quality of gas protection given to the electrode after the arc has been extinguished is of the utmost importance and it hinges upon two factors: inert-arc welder design and electrode-holder design. The electrode holder should be properly designed to cool the electrode very quickly. The welding machine must provide an automatic means of controlling the gas flow to give the required gas protection. The automatic feature of gas protection is especially important since even a few seconds of insufficient gas protection are enough to cause the electrode to oxidize.

Gas Cost vs. Tungsten

The interrelationship between the machine and holder points to the fact that they ought not to be designed independently. If the gas-protective time provided by a machine is too short for the holder, excessive tungsten loss and tungsten-contaminated welds may result. If the gas-protection period is too long, then a wastage of gas can result. If the gas is on 10 seconds too long and there are assumed to be 20 stops per hour, the value of gas lost while welding at 400 amp may be as much as $1.50 per eight hours of welding time.

Before a definite answer can be given to the query, "How long will an electrode last?" shop studies will have to be made in plants using inert-arc welding in some regular production schedule. The items that may be taken into consideration are gas flows, current levels, operator skills, manual or machine operations, number of arcs and type of equipment being used.

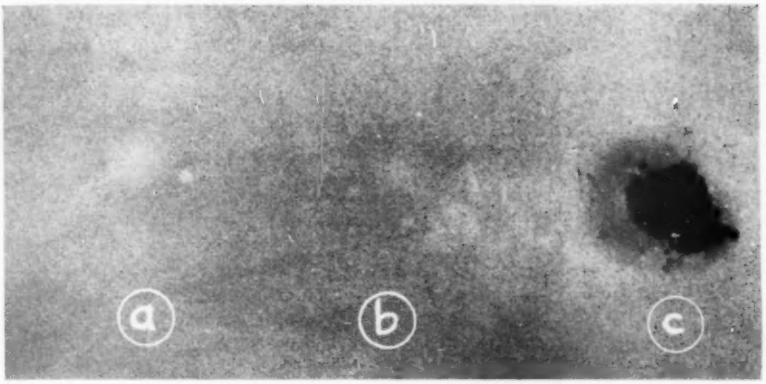
Specific Example

Let us consider a hypothetical case of a welder working manually at 200 amp using a 5/32-in. tungsten and a gas flow of 20 cu ft per hour. We will assume a 40% duty cycle for an eight-hour day and perfect welding conditions, which include an experienced operator and good gas coverage, both during and after the arc is stopped. For convenience, we will assume welds are of one-minute duration.

Eight hours at 40% duty cycle gives 3.2 hr of arc time or 192 minutes, representing 192 cold starts. Using the tungsten losses previously given, 192 times 0.0005 in. per start gives 0.096 in. of tungsten lost in starting. The 3.2 hr of arc time multiplied by 0.004 in. per hr gives 0.012 in. of lost tungsten in welding. Adding the two types of losses, we have: $0.096 + 0.012 = 0.108$ in.

If the gas was shut off immediately

tip. **tungsten inclusions in welds are apt to result**



4—X-RADIOGRAPH of three starts in Fig. 3. Sample is a 3/16-in. aluminum plate welded with 5/32-in. tungsten at 200 amp. (a) Cold start, non-oxidized tungsten; (b) hot start, non-oxidized tungsten; (c) cold start, oxidized tungsten. Start (c) is the only one resulting in inclusions in the weld

following each weld, the theoretical tungsten loss is determined by using the loss figure of 0.015 in. for a cold oxidized start. Multiplied by 192 starts, the larger figure gives us 2.88 in. of lost tungsten for starting. To this must be added the previously calculated 0.012-in. loss in running time, giving a total of 2.89 in. of lost tungsten.

A 5/32-in. ground tungsten rod 4 in. long costs about 17 cents. If the stub length is 1 in., then the electrode consumed will cost $\frac{1}{3} \times 17c = 6c$ per usable inch. The cost of tungsten for one day's operation is: $0.108 \times 6c = 0.65c$ for clean tungsten and $2.89 \times 6c = 17.3c$ for oxidized tungsten.

Now, let us consider the cost of the gas it took to protect the electrode while cooling. We will allow a cost of ten cents per cubic foot for argon gas and assume a cooling period of 10 seconds after the arc is stopped. Multiplying the 192 stops by 10 seconds gives us 32 minutes for which gas must be supplied. 32/60 hr $\times$ 20 cfh $\times$ 10c per cu ft = a gas cost of $1.07. This is slightly over six times the cost for oxidized tungsten. The question naturally arises as to the economy of protecting the tungsten while cooling with the much more expensive gas.

Cooling the tungsten in gas seems to have two advantages other than the actual saving in tungsten. First, it prevents tungsten contamination of the work, which may or may not save money depending on whether or not the metal is X-ray tested and rewelded. Second, it will save an indeterminable amount of the operator's time if he does not have to keep adjusting the tungsten for rapid burn-off. It would require only one or two adjustments per day for 0.1 in. of tungsten lost and many times that to adjust the tungsten for the almost three inches of tungsten burn-off resulting from non-protection. The weight of tungsten used per arc at the 200-amp current would range from ½ lb per year for the best conditions to about 15 lb per year at worst conditions. It is a case of checking one loss against another and making the best decision according to all of the factors concerned.

Watch Tip Color

To summarize, items such as stubbing the electrode, current density and type of starting are important to the user. However, the major cause of tungsten loss and contamination of welds is the result of improper care in protecting the electrode with inert gas during the cooling period. A good check on whether good cooling is being obtained in your operations is to view at random several used pieces of electrode. If they are not bright and shiny on the tip (see (c) of Fig. 1) but have become brown, blue or dusty yellow, then proper gas protection is not being obtained. Tungsten is likely to have been deposited and, regardless of whether or not it is chipped out, the electrode consumption on the job may be as much as 25 times normal.

AIR STORED IN FRAMEWORK

(*Continued from page 41*)

for six months without testing, and those at the extreme end of the air system never showed sufficient accumulation of liquid to reach to the height of the drain. Fig. 6 shows the drain plug at the base of the left one of twin columns along the center bay. The use of a pipe plug instead of a valve tells that these columns are far from the compressor and need for drainage is infrequent.

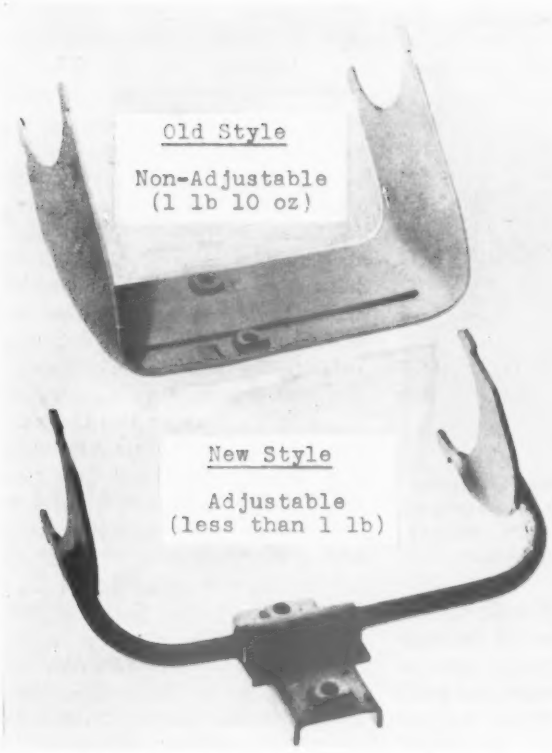
No drains were set into the craneway columns since there was no air flow through these units. No accumulation of water could build up higher than the tie-in nipple of 2-in. pipe without flowing through the connector into a drain-equipped column.

Tap a Column for Air

If air is desired at any point in the shop, it is necessary only to weld a collar on the nearest column, tap in under pressure, and attach enough air hose to reach the point of actual use. Such an outlet is pictured in Fig. 7. When a post is tapped, the valve is usually fitted on the side away from a working machine and away from the sweep of the main crane or any auxiliary hoists.

Having more than three times the normal quantity of compressed air in storage, Forsyth finds it possible to shut down the compressor for a complete overhaul without depriving the shop of air. In one case the system was charged to boost the pressure from the usual 100 psi gauge to 125 psi. The compressor motor was then sent out for rewinding, and it was returned in plenty of time for re-installation before the stored air had been used up.

In view of the large capacity afforded by the building framework, a small compressor with a 61-cfm rating is ample to meet all needs. This 15-hp unit (Fig. 8) is motor-driven through a flat V-belt and pressure-controlled to be completely automatic in operation. A pressure gauge is mounted on a column near the compressor (Fig. 9) to provide a visual check of the air. It may be easily read without climbing to the storage shelf on which the compressor is located.



1—NEW TYPE of pivoting motor mount was made by resistance welding parts to a steel rod mounted in a swivel. The old style was formed from heavy-gauge sheet

3—PROJECTION WELDING a small stop pin to the hanger rod was the first operation, done on a 50-kva welder. Note rods before (right) and after welding

Better Motor Mount

Old motor mount for the Maytag electric washer, formed of heavy-gauge sheet steel, was non-adjustable. New mount weighs 40% less and may be adjusted. The secret: design for resistance welding

IT WOULD be difficult to find a more apt and simple illustration of what designing for resistance welding can do for a product than the cradle mount for the motor of the latest type of electric washer produced by The Maytag Co., Newton, Ia.

As compared (Fig. 1) with the mount used on the 5,000,000 washers with which Maytag set a world's record, the new mount is:

(1) Self adjusting to maintain correct belt tension automatically. The former was not.

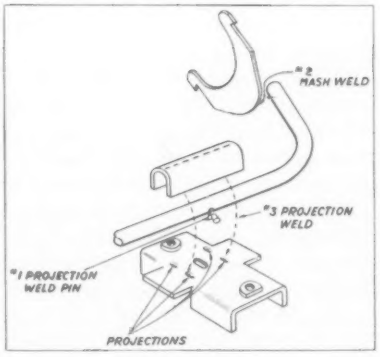
(2) More complicated in design, yet easier and cheaper to produce.

(3) Stronger in construction, yet weighs 40% less and requires two thirds less critical sheet steel per mount.

Actually, Maytag did not start out to produce a less costly and materials-saving design. It wanted primarily a mount that would reduce the burning out of motors caused by drive belts being too tight. The other advantages were pure velvet—the result of deciding to investigate the possibilities of resistance welding and designing the mount with that process in mind.

THREE OPERATIONS

The design and processing were worked out coöperatively by Maytag and the Progressive Welder Co., Detroit. Parts from which the new mount is fabricated and the order of the three welding operations are

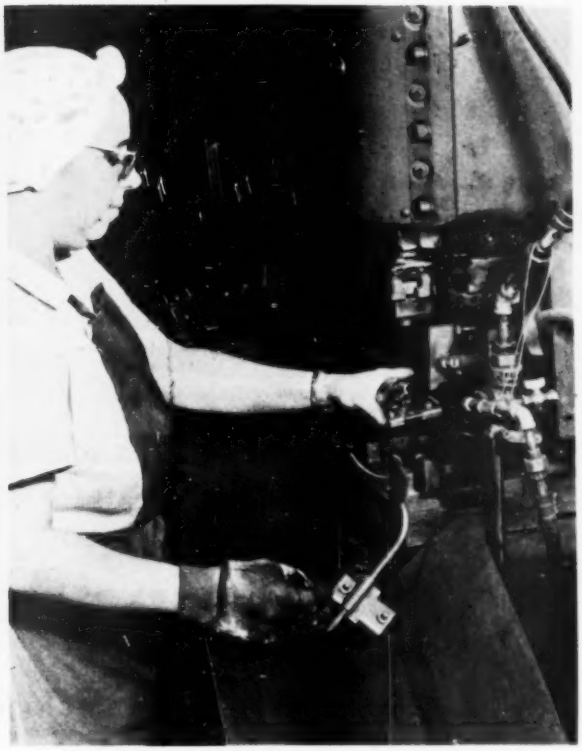


2—THREE OPERATIONS were performed (see Figs. 3, 4 and 5)

shown in Fig. 2. The actual operations and machines by which the parts are assembled appear in Figs. 3, 4 and 5.

Comparing the new with the old design (refer back to Fig. 1), it will be noted that low-cost steel rod, bent into a U-shape and mounted in a

4—MASH WELDING motor mount plates to the two ends of the hanger rod. Under continued current and pressure, the weld spreads out something like a flash weld



5—FINAL STEP is to projection weld the hanger assembly to its base. This is done in a 150-kva press welder. The operator is holding a completed motor mount

t Costs Less

swivel, has replaced much of the heavy-gauge sheet steel. The first operation is to projection weld a small pin or nipple (to limit the swing of the motor support) to the rod. This is performed with a 50-kva pedestal welder (Fig. 3). The nipple is dropped into a recess in the lower electrode, and the rod is located in position by brackets on the machine.

Mash Welding End Plates

Fig. 4 is a close-up of the second operation: mash welding the mounting plates to the two ends of the rod. This is done in a 250-kva press welder. Tangential contact between the flat plate and curved surface of the rod forms the "projection" for the start of the weld. Resistance to current flow at this narrow zone of contact causes the metal to fuse. Under continued current and welding pressure, the weld spreads out in a manner similar to a flash weld, joining the entirely different pieces into a single rigid unit.

For the third and final operation, the hanger assembly formed in the first two steps is transferred to a 150-kva press welder (Fig. 5). The small pin on the hanger rod is inserted into a slot in the stamped nut plate; a semicylindrical bearing sleeve is placed over the rod and is then firmly welded to the base plate at the four projections on the latter.

A cork silencer is cemented to the sleeve before it is projection welded to the base plate. The silencer serves to eliminate the possibility of vibration and rattles when the washer is in service and also distributes the pressure evenly along the bearing of the shaft and prevents binding.

The silencer is placed off-center in the sleeve to obtain a wedging effect as the sleeve is squeezed down over the hanger rod during the welding operation. This prevents anything except rotational motion of the rod within the bearing after the unit is assembled.

Final Assembly

In the assembled unit, the off-center weight of the motor hanging from the mounting plates tends to swing the motor away from the "driven" belt pulley on the agitator drive shaft, thus maintaining uniform tension on the belt. The small pin on the side of the hanger rod slides freely in the transverse slot of the nut plate, limiting motor swing to a 60-deg arc and preventing axial motion of the motor with respect to the nut plate to keep belt pulleys in line. Errors in mounting the motor bracket in the washer are much less likely to cause the belt to run too tight and burn out the motor than with the fixed type bracket.

Courtesy American Tank Co., Oklahoma City

SIZE IS NO BAR to welded fabrication, as is evidenced by this mammoth refraction tower for the petroleum industry

What Welding Means to America

★ PART TWO: Fabricated Metals Industries

BY T. B. JEFFERSON

WHENEVER metals are joined it is only natural to expect the widespread use of welding. Especially is this true in the fabricated metals industries, as is disclosed by a recent survey made by THE WELDING ENGINEER. In a previous article* in this series there was discussed the extent and kind of welding used in the primary metals industries. The present installment is concerned entirely with the fabricated metals industries.

Fabricated metal products include a wide range of items from large fabricated structural metal products to tin cans. Items which might fall within this category include such diversified manufactures as cutlery, heating apparatus, lighting fixtures, wire products, etc. In all, 2,587 plants in the fabricated metal products field (Table V) were queried. These included every plant in this group in the United States employing 100 or more workers and every other plant having between 50 and 99 employees. A total of 1,088 plants—42% of those queried—released information on their welding activities.

Welding for either maintenance or production purposes was in use in 946 plants (Table VI) or 87% of the 1,088 plants answering the questionnaire.

WELDING FOR MAINTENANCE

Of the 946 plants using welding, 92% (868 plants) use welding processes for maintenance applications. Arc welding is used in 748 plants, while oxyacetylene welding and flame-cutting are employed in 736 plants. There is only one percent difference between the total number of plants using arc welding for maintenance (86% of 868) and those using oxyacetylene welding and flame-cutting (85%). Of course, many plants used both arc and gas processes, which accounts for the discrepancies in the totals. In some cases, arc, gas and resistance welding as well as flame-cutting are all in use in a single plant.

One of the surprises of the survey is the comparatively large use of resistance welding in maintenance applications; 14% of the 868 reporting plants (121) use spot and other resistance welding methods for the repair of sheet metal and wire guards, covers and protective devices.

Table V shows that 98% of the 227 responding plants engaged in the fabrication of structural metal products are users of welding. Such high use is to be expected among this group, which produces overhead cranes, pressure vessels, food-processing equipment and similar large items.

Fabricated wire products (wire

Courtesy Air Reduction Sales Co.

STRUCTURAL METAL fabricators are heavy users of flame processes. Here flame-cleaning descales bent channels in preparation for paint

*See THE WELDING ENGINEER, February, 1949, page 38.

Table V. Analysis of Respondents by Industries

Fabricated Metal Products	Plants Surveyed	No. Plants Responding	Do Welding Number	Do Welding Percent	Do Not Weld Number	Do Not Weld Percent
Tin cans and other tinware	101	44	37	84	7	16
Cutlery, hand tools and general hardware	343	126	102	81	24	19
Heating apparatus (except electric) and plumbers' supplies	500	227	202	89	25	11
Fabricated structural metal products	546	227	222	98	5	2
Metal stamping, coating and engraving	399	172	145	84	27	16
Lighting fixtures	100	32	26	81	6	19
Fabricated wire products	154	68	63	93	5	7
Miscellaneous fabricated metal products	444	192	149	78	43	22
Total	2,587	1,088	946	87	142	13

Table VI. Maintenance and Production Welding

Fabricated Metal Products	Maintenance Welding Total*	Maintenance Welding Arc	Maintenance Welding Gas	Maintenance Welding Resistance	Production Welding Total*	Production Welding Arc	Production Welding Gas	Production Welding Resistance
Tin cans and other tinware	37	26	36	2	18	10	10	11
Cutlery, hand tools and general hardware	97	79	83	11	68	36	30	47
Heating apparatus (except electric) and plumbers' supplies	185	159	167	20	172	143	122	90
Fabricated structural metal products	193	189	144	25	212	199	111	77
Metal stamping, coating and engraving	129	112	110	31	104	65	57	83
Lighting fixtures	23	19	21	7	20	10	8	16
Fabricated wire products	60	51	51	9	40	22	15	33
Miscellaneous fabricated metal products	144	113	124	16	73	53	37	41
Total	868	748	736	121	707	538	390	398

**The figures for arc, gas and resistance welding exceed the total because of duplication of types of welding within plants.*

Table VII. Sizes of Plants

Fabricated Metal Products	Number of Employees 50-99	100-499	500-999	1,000-2,499	2,500+	Total
Tin cans and other tinware	5	22	9	1	—	37
Cutlery, hand tools and general hardware	15	16	19	5	2	102
Heating apparatus (except electric) and plumbers' supplies	28	118	35	15	6	202
Fabricated structural metal products	53	142	14	11	2	222
Metal stamping, coating and engraving	32	90	16	7	—	145
Lighting fixtures	3	15	5	2	1	26
Fabricated wire products	7	44	6	2	4	63
Miscellaneous fabricated metal products	24	86	29	9	1	149
Total	167	578	133	52	16	946

Table VIII. Number of Weldors

Fabricated Metal Products	Number of Employees 50-99	100-499	500-999	1,000-2,499	2,500+	Total
Tin cans and other tinware	21	65	11	1	—	98
Cutlery, hand tools and general hardware	31	315	166	14	62	588
Heating apparatus (except electric) and plumbers' supplies	170	1,179	523	395	630	2,897
Fabricated structural metal products	620	2,498	911	1,018	373	5,420
Metal stamping, coating and engraving	73	608	387	169	—	1,237
Lighting fixtures	30	69	14	21	30	164
Fabricated wire products	24	501	51	47	260	883
Miscellaneous fabricated metal products	59	428	530	186	30	1,233
Total	1,028	5,663	2,593	1,851	1,385	12,520
Average number of weldors per plant	6	10	19	36	86	13

Courtesy Bethlehem Steel Co.

PRODUCTION AND MAINTENANCE jobs in one shop. While the big box girder for a bending roll is welded, the 200-ton ladle on the right awaits minor repairs

Courtesy General Electric Co.

RESISTANCE WELDING is employed to fabricate products so diversified as an oxygen tank, an ignitron tube, an oil diaphragm and (top) an ammunition box.

baskets, display stands, floral frames, household novelties, etc.) were next high in the use of welding. In this group 93%, 63 of the 68 reporting plants, were welding users. In the fabricated wire products plants there was an indicated 95% use of welding in maintenance applications and a 64% production use. An 82% application (based on 40 production users) of resistance welding in the production of fabricated wire products proved to be the highest use of the process in the fabricated metal products industries. A variety of resistance-welding processes such as flash, butt, cross wire, projection and spot welding were employed.

Other industries in the fabricated metal products group use welding in percentages ranging from 78 to 89%.

The highest use of arc welding for both maintenance (83% of responding plants) and production (88%) was found among makers of fabricated structural metal products. This industry is a big user of the oxyacetylene processes, too, including flame-cutting, flame-priming, flame-cleaning, flame-hardening and other flame-treating methods.

Oxyacetylene welding and cutting methods were found to enjoy the greatest use for both maintenance (74% of responding plants) and production (54%) in the manufacture of heating apparatus (except electric) and plumbers' supplies.

The overall production picture reveals that 707 plants—75% of 946 plants doing welding—are using the arc welding, gas welding and flame-cutting and/or resistance welding in producing their manufactured products. Arc welding is used as a production process in 57% of the 946 plants doing welding, oxyacetylene welding and flame-cutting in 41% and resistance welding in 42%. Contrary to the thinking of some prognosticators, the market for resistance-welding machines would appear to be far from saturated.

Plant Sizes and Weldors

Tables VII and VIII present data regarding the number of plants in each of the five employment categories surveyed and the number of weldors in each category. Sixty-one percent of the 946 plants indicating a use of welding employed between 100 and 499 persons and had a total of 5,663 weldors in the 578 plants involved. The 100-499 size has by far the largest number of both plants and weldors.

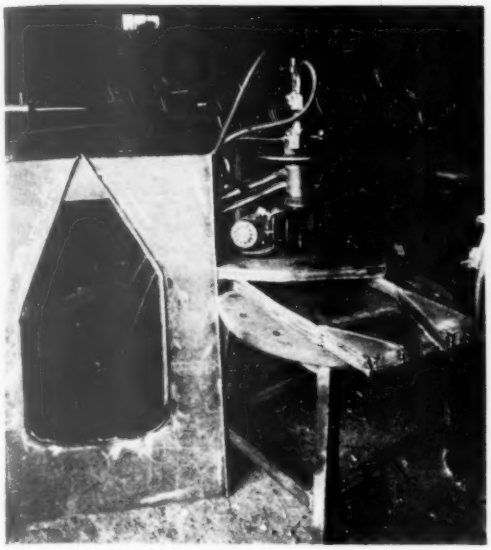
Table VIII shows a total of 12,520 weldors, an average of 13 weldors per plant for all industries in this group, on the basis of the 42% response. Projected on a 100% basis, we may estimate that there are at least 40,000 weldors employed in the fabricated metal products industries.

In Table VIII it is interesting to note that, on an average, as the size of the plant increases there is a marked increase in the number of weldors in the plant. A plant with 50-99 employees has an average of 6 weldors, which number increases rapidly to 86 weldors in plants where more than 2,500 are employed. These general averages are not true when applied to the manufacturers of tin cans and other tinware.

By correlating the information presented in Tables VII and VIII it is possible to develop interesting market information. Taking the producers of tin cans and tinware, for example, we find that there is a tendency in this group to reverse the normal trend in the use of welding. Instead of the number of weldors increasing as the production capacity increases, it is the smaller plants that have the greater number of weldors. In plants employing 50-99 there were, on an average, 4 weldors per plant among the respondents; in plants with 100-499 employees, 3 weldors; while the groups with 500-999 and 1,000-2,499 showed only one weldor per plant.

While The Welding Engineer surveyed only 101 plants in the tin can and tinware field (it is estimated that there are 209 plants in all employment categories), it is easy to see that this group is not making the best use of welding. Any plant large enough to have over 500 employees most certainly has sufficient machinery maintenance to warrant the employment of a larger maintenance welding crew than one lone weldor. Naturally an even greater number of weldors would be required if welding is also used in production.

Next Month: *Machinery*



1—TEMPLATE (left) consists of ¼-in. welding rod tack welded to a ¼-in. base plate

2—SHAPE-CUTTING 40 stacked sheets in a single operation. The cut is started in 2-in. space left at hub end of fan blade

Rod Template for Stack Cutting

A shop-made grooved driving wheel enables the tracing unit of a portable shape-cutting machine to run on a "track" template made by bending welding rods and tacking them to a heavy base plate

BY PHIL GLANZER

A METAL FABRICATOR devised a template of welding rods for guided shape-cutting with a portable cutting machine. His problem was to cut circulating fan blades from stacked 14-gauge sheets and thus eliminate the square corners obtained when the blades were sheared. The welding-rod template proved to be inexpensive and easy to make. It can be adapted to any roller type of template tracer to cut curved sections of almost any shape.

Making the Template

The template, Fig. 1, consists of pieces of ¼-in. steel welding rod and a steel base plate ¼ in. thick. The rod was heated and bent to gradual curves to prevent the machine driving wheel from binding; it was then tack welded to the plate to outline the shape of the finished fan blade. The plate area enclosed by the rod was removed by flame-cutting to complete the template.

To operate the cutting machine on this "track" template, the standard driving wheel was replaced with a special grooved driving wheel made in the fabricator's shop. The groove in the wheel was machined to fit the ¼-in. welding rod.

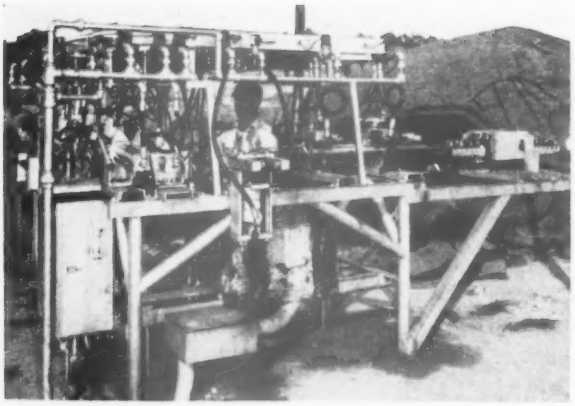
Use of the template is illustrated by Fig. 2. First, 30 to 40 sheets were stacked evenly on work supports, and weld beads were laid across the edges to bind the sheets tightly together. These beads can be seen on the scrap metal below the machine in Fig. 1. The template was then placed on top of the stacked sheets so that the narrow end overhung about 2 in. beyond the edge of the stack. The cut could be easily started at the edge of the stack.

The template base plate and workpiece support the rear wheels of the machine. Since the base plate is ¼ in. thick, one rear wheel will be ¼ in. lower than the other, and the torch will be tilted slightly from the perpendicular. On jobs where extremely close tolerances are important, the machine can be leveled by lowering one of the rear wheels by an amount equivalent to the thickness of the template base plate. The machine can also be leveled by riding the rear wheel on a spacer plate placed on top of the workpiece inside the line of cut. Still another way of leveling the machine is to make the template large enough for both rear wheels to be able to ride on the base plate.

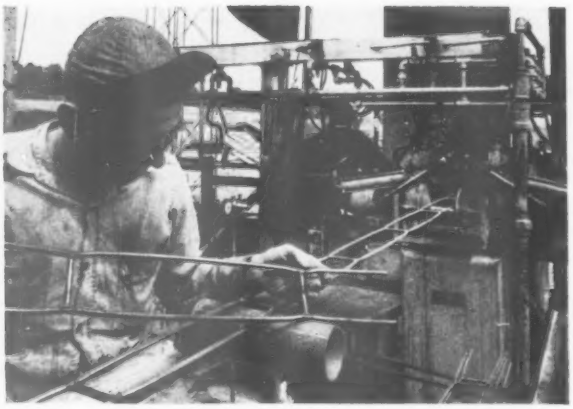
Stack-Cutting Operation

The cutting operation itself was a routine stack-cutting job. After the machine was positioned on the template, the grooved driving wheel automatically followed the shaped welding rod, and the torch cut the circulating fan blades from the stacked sheets at a speed of 15 ipm. No clamps were needed since the weight of the machine and template kept the latter from shifting during cutting.

The portable cutting machine is an invaluable aid in speeding up production in both large and small shops. In addition to the many cutting jobs that this machine performs, it has been successfully applied to such specialized tasks as plate-edge preparation, cutting and beveling pipe, flame-hardening and mechanized welding and soldering.



1—STUD WELDER (side view). Solenoid-hydraulic controls hold stud rods in correct position to be welded



2—RODS ARE FED in parallel lines to stud-forming machine. Welded stud sections look like small ladders

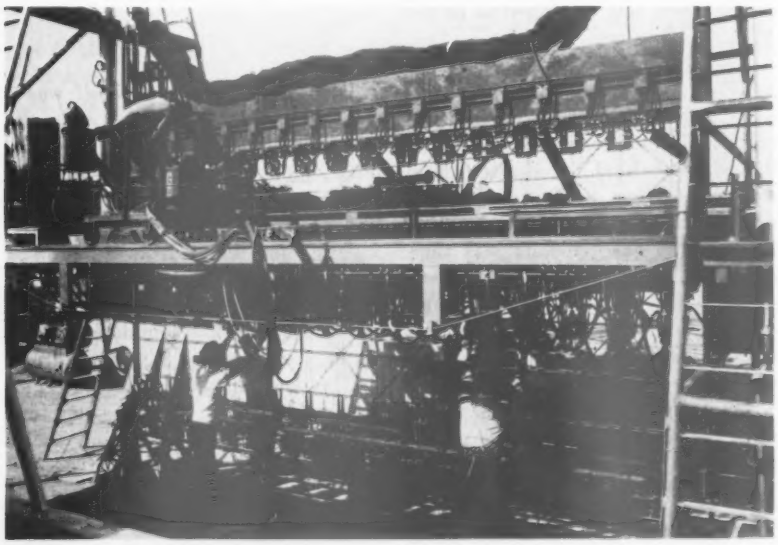
Prefabricated Skeletons f

Reinforcing panels for concrete construction are woven on a giant loom, threads of which are ⅜ and ¼ in. rods. Separate panels, produced in manageable sizes, are welded together at the field site

BY TED PALMER

STEEL CAGES for big-scale reinforced-concrete construction are now being prefabricated on a mass-production basis as the result of development of machines for this purpose at the plant of the Steel Building Units Corp., Whittier, Calif. The company's specially designed manufacturing equipment fabricates welded panels in standard sizes that can be readily handled.

Currently, the plant is producing one 8 by 20 ft panel every 30 minutes. Fourteen men are used in the fabrication processes, equipment for which includes the stud machine with a projection-welding unit, the diagonal strut machine and, finally, the massive loom in which the reinforcing units are woven into final shape.

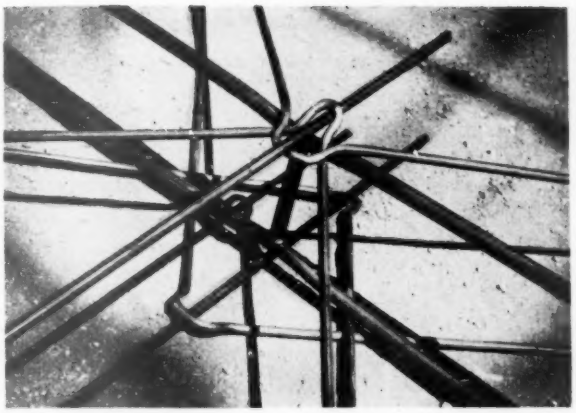


5—FIRST SEGMENT of reinforcing unit is being placed in foundation trench. Above is the massive loom which weaves the final shape. The rods are drawn upward under tension and locked together at 16-in. intervals

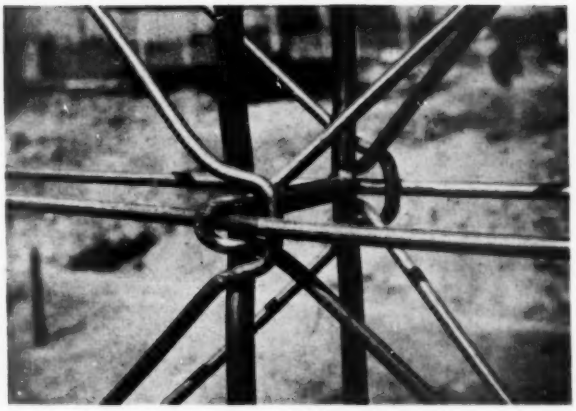
FORMING STUD SECTIONS

In producing the reinforcing units, new bright ⅜-in. rod is first fed through a reel unit into the stud machine (Fig. 1). As pneumatic, hydraulic and soleroid controls have been built into the machine, two men can handle this phase of the operation. The rods are straightened by a hydraulic reciprocating feeder and pass through the hydraulic press that forms knot sockets to hold the spacers. The latter are then projection welded to the rods to form studs. The studs are cut off and straightened to complete this phase of the operation. The completed studs (Fig. 2) now have the appearance of small ladders.

While stud sections are being fabricated, the diagonal shaping machine forms the right and left diagonal trusses. This large and complex machine has 70 solenoid controls on each side of the vise bank, resulting in 140 solenoid controls for the vises that make the male and female knots. A ¼-in. bright rod is used to provide the diagonal trussing.



3—LOOSE GATHER of studs, diagonals and horizontals prior to being pulled into the loom (see Fig. 5)



4—JUNCTION OF STUDS, diagonals and horizontals as the finished structural units come from the loom

s for Building

In the final or loom stage of production, the welded stud sections, diagonals and horizontals are gathered together as in Fig. 3 and pulled into a compact knot under tension as in Fig. 4. The loose ends of the fabrication are fixed to the so-called follow beam, and the top ends of the fabrication are attached to the lead beam. The lead beam is raised, and, with the threaded material in proper place, the first welds are made at 16 in. Then the lead beam is raised 16 in., and with the material in this stretched position, the welding straight across all junctions at the 16-in. level is repeated. A leveling unit perfected by Henry Foster, aeronautical engineer of Burbank, Calif., is linked into the operation and makes corrections to within 0.0015 in. throughout the 21-ft span of the lead beam.

The weaving concludes with the last 16 in. of the unit as specified by dimensional specifications. The finished unit is then released from the loom machine (upper part of Fig. 5).

On the site, the welded structures are set in the foundation trench (Fig. 5) where the cement is poured around them. Weighing but 200 lb, a reinforcing unit can be readily placed by two men. Additional prefab reinforcing structures are welded onto the lower units to obtain the desired height and shape of the finished structure. There are no door nor window openings; experience has shown that it is more efficient to place whole units and cut out openings afterwards.

Panels Welded Together

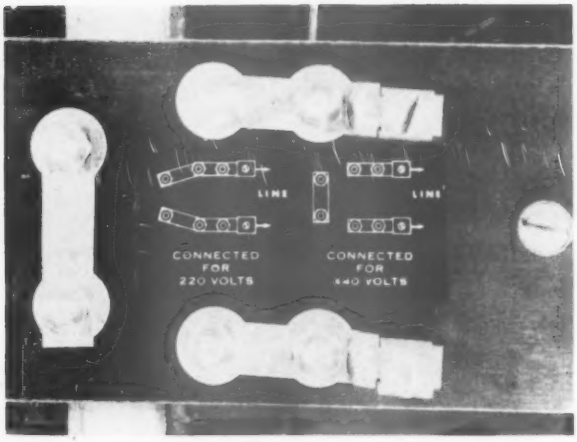
Vertical structural units are welded together manually (Fig. 6) in order to provide continuous side-wall reinforcing. Horizontal structural reinforcing sections are also welded together for roof or ceiling construction (see front cover illustration).

Sawed forms, nails and wiring of forms are all eliminated when this type of reinforcing is used. The erection plan calls for the use of helixal clamps (Fig. 7) and plywood, both of which are reusable on subsequent jobs. Where poured concrete is planned, two sides of plywood are used, while pneumatic concrete structures only need one plywood form. Small holes left by the clamps can be readily filled and finished after the forms have been removed.

For the future, William Hughes, head of Steel Building Units, expressed the belief that as additional licensed fabricators are established in key areas throughout the country, structural steel and concrete homes and business buildings will cost less than buildings erected under old methods. The company's present 60,000 sq ft capacity will have to be increased, President Hughes predicted.

6—VERTICAL structural units are manually welded to provide a continuous side-wall reinforcing

7—LOCK CLAMP for affixing reinforcing to plywood forms before pouring or blowing the concrete. Clamp permits forms to be removed after concreting without damage



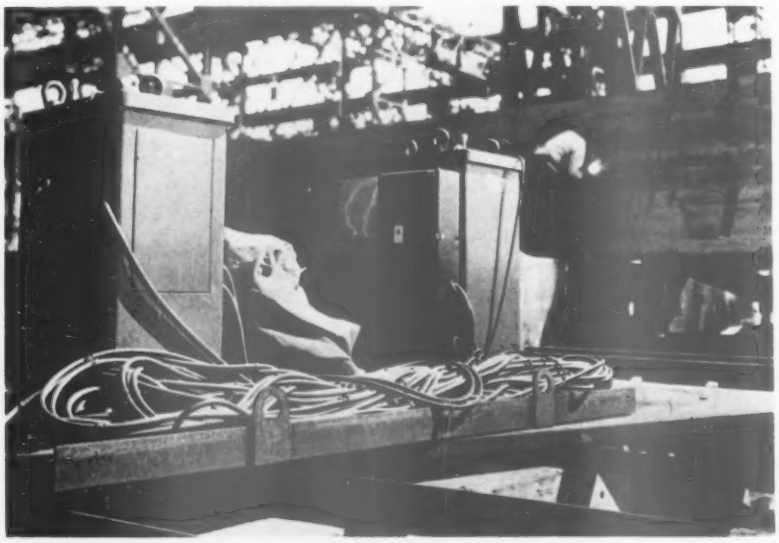
SAFETY STARTS at primary terminal board. Clear, concise markings aid in reconnecting. Only competent persons should be authorized to change connections

CLEAR MARKING facilitates safety with high-frequency-stabilized inert-arc welder. Welder, ground, torch, argon and water connections are all plainly indicated

Arc Welding in SAFETY*

Safe arc welding requires safe machines, safely installed, and safe cable and electrode holders. Operators must wear proper helmets and gloves. Ventilation and protection against fire must be considered

BY W. W. REDDIE
Assistant to Manager, Arc Welding Dept., Westinghouse Electric Corp., Buffalo



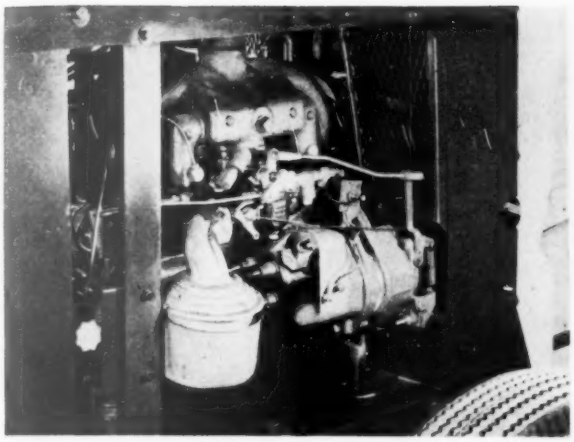
GROUP OF TWO 500-amp welders into a portable unit for outdoor work follows the safe practices discussed in text. Space is provided on the platform for coiling welding cables. Welders are equipped with automatic open-circuit voltage control. Primary connections are through a breaker mounted on the welder, and a three-conductor primary cable containing two power conductors and a grounding cable run back to the service connection

ARC WELDING is not essentially a hazardous process. We know that if we try to dodge traffic by crossing busy intersections against the signals or fail to properly safeguard gearing or press operations accidents are bound to occur. Similarly, there are factors in the practice of arc welding which if neglected will allow accidents to happen.

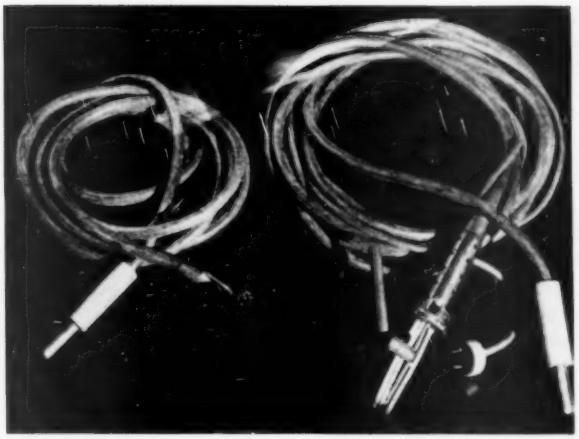
WELDING MACHINE STANDARDS

The National Electrical Manufacturers Association has, over a period of years, developed standards for arc-welding machines and kept these up to date as new developments or practices became established. These standards cover established practice in ratings, basis of rating, methods of test and broad overall principles of construction contributing to safety.

*Abstract of paper presented before the "Causes and Effects of Electrical Hazards Session" of the 36th National Safety Congress, Chicago.



FAN GUARD on a gasoline-engine-driven welder is a safety precaution that is often neglected. In general, rotating parts should be guarded for the sake of safety



ELECTRODE AND GROUND leads. Each lead is a continuous 18-ft length of rubber-covered flexible cable. The electrode holder is of the fully insulated type

It must be recognized that arc welders are subject to extremely hard usage indoors, receive little, if any, added protection outdoors and rarely get expert attention. In many installations, production requirements call for portable machines, which may readily be moved about on their own running gear. Consequently, unusually rugged construction with relatively light weight is required.

The NEMA standards establish the ratings of arc welders on the basis of industrial ratings, both a-c and d-c, on the basis of 60% and 50% duty cycle. In the case of a-c transformer-type welders, a third class is added, which is known as the limited-input welder.

The 60% duty cycle machines covering ratings 200 amp and over are usually called heavy-duty welders. The 50% duty cycle machines, rat ings 200 amp and below, are intended for lighter welding operations. The limited-input welders are pri marily for use on single-phase circuits of limited capacity such as are found serving small shops, service garages and farms.

The 50% duty cycle and limited-input welders are essentially portable machines in that they are not used in a fixed location and, in general, not even in a fixed area. Consequently, standard practice is to provide them with primary service cable and fittings and with complete sets of welding accessories. Since they are generally used in locations and in shops where expert supervision is not available, they are usually listed by the Underwriters' Laboratories, Inc. Direct-current welders and a-c welders in the 60% duty cycle class usually go into the industries where good supervision of installation and operation is available and, consequently, these machines are not listed by the Underwriters' Laboratories.

In addition to following recognized standard practices, the manufacturer can contribute a great deal to safe operation through careful attention to details of construction such as terminal markings, enclosures, internal wiring and wiring details.

Usually, in industrial practice, the primary or source of power wiring gets the most attention. In welding operations, the welding circuit—output side of the machine—is equally important. The welding operator is exposed to the voltage on the output side of the machine, and every effort should be made by the manufacturer to foresee and eliminate any possibility of primary wiring coming in contact with secondary wiring under accidental conditions.

Installation Procedures

The 1947 edition of the National Electrical Code for the first time covers the proper installation procedures for both d-c motor-driven and transformer-type a-c welders. These rules were carefully developed over a period of several years and constitute standardized practice as to size of primary conductors and circuit protection. The code recognizes that arc welding is a duty cycle and not a continuous load and provides for selection of primary supply conductor feeding groups of welders on this basis, thus leading to savings in the amount of copper for the primary circuits.

It has been standard practice, over a period of years, to use magnetic starters rated in amperes instead of horsepower for starting the motors of motor-driven d-c welders; the code now recognizes this practice.

Practice on primary breakers at the welder has varied in the case of a-c welders. The code now requires that a properly rated switch or circuit breaker be installed in the primary connection of the welder unless it is supplied as part of the welder.

In none of these cases does the motor starter, switch or circuit breaker mounted on or at the welder provide protection for the power supply circuit, and the code requires the usual circuit protection.

It is also pointed out that any device mounted on the a-c welder should be capable of opening the circuit under any conditions of load. Contactors are not in general use because they are not circuit breakers. The code covers the proper selection of breakers or switches for the duty required.

Provision must be made in all cases for grounding the frame or case of the welder, in order to protect the operator against the possibility of exposure to the power supply voltage due to possible breakdown of insulation in the machine. Although such a breakdown is improbable in

modern machines, this safety measure should always be observed.

Groups of Welders

In grouping welders, indiscriminate connecting without attention to polarity and phase relations of the individual welders can result in combinations of voltage which under possible, even if remote, circumstances could expose the operator to a considerably higher open-circuit voltage than the maximum 80 volts recommended in the NEMA standards.

To illustrate the point, consider two d-c welding generators, one set up for straight-polarity work (holder negative) and the other set up for reverse-polarity work (holder positive). The open-circuit voltages in this case would be additive. Assuming the "work" terminals of these two welders to be grounded as in normal practice, a person coming in contact simultaneously with uninsulated parts of the electrode terminals, cables or holders would complete the circuit and be subjected to the sum of the individual voltages of the two machines, say 160 volts in the case of machines having open-circuit voltages of 80 volts.

If a-c welders are not properly phased, similar freak conditions can exist and these can readily be avoided by following the methods of grouping the welders recommended in the American War Standard on Safety in Electric and Gas Welding and Cutting Operations.

The welding circuit consists of welding service cable for the electrode lead and work lead, electrode holder, ground clamps and connectors for providing extensions to the leads. These parts are all subject to hard usage and abuse and, over a period of years, have been highly developed to meet both service and safety requirements.

Cable and Holders

Welding cables have been developed to meet requirements of flexibility and hard usage, and cable of this type and of a capacity to meet the maximum current requirements of the job should always be used. Standard tables are available covering recommended cable sizes according to amperage capacity and length of leads. When cable extensions are necessary, substantial insulated connectors of the locking type should be used.

FOLDING SCREEN shields workers near welding from harmful arc flash. In this picture, an automatic-welding operation (not shown) is going on just beyond the screen. The manual weldor is working on a large bedplate

The work lead (cable) is the most satisfactory means of providing the return circuit (ground) from the work to the welder. Some operating conditions may necessitate use of a steel structure or pipe line for the return circuit. Under such circumstances, precautions must be taken against creating unsafe conditions.

Pipes carrying gases, flammable liquids or electrical conductors should never be used for ground returns. Pipes or structures used for ground returns should have all joints checked to make sure there is no sparking or heating that could constitute a fire hazard. Joints should be bonded if such structures are to be permanently used.

Electrode holders broadly fall into two classes: holders which are fully insulated and those which are insulated except for the electrode-gripping jaws. Many bare-jaw holders are still used but the trend is toward the fully insulated type.

The fully insulated type should always be used with a-c welders, as it will, if properly made, afford additional operator protection. Care should be taken to make sure that fully insulated holders do not have exposed screw heads on any portion of the holder that might come in contact with the operator.

Where service conditions permit, a continuous length of cable should be used from the holder to the machine to avoid joints which might come in contact with the operator. In no case should cable splices be permitted within ten feet of the electrode holder.

In the case of portable welders, either large or small, care should be taken to see that cables for primary supply are kept free of the welding leads and that welding leads should be kept in order and so placed as not to tangle with the operator, other people or other objects near the welding operations. Failure to observe these simple rules can and does lead to serious or even fatal accidents.

The arc and the molten metal are localized in a very small area where the welding is actually taking place. but there are strong radiations of light and heat rays and a considerable throw-off (spatter) of incandescent particles of slag and molten metal. Gases and fumes are generated at the arc during welding. These conditions call for education and protection of operators from injury due to shock, burns, and light radiation, provision for ventilation and protection of property from fire.

Shock Protection

Referring first to electric shock, normally the work set-up is such that the work is grounded. Unless

SAFETY GOGGLES must be worn during grinding and chipping. This picture shows correct practice: both operator and inspector are equipped with goggles. While welding, the operator wears his goggles underneath his helmet

care is exercised the operator can easily become grounded, too. The voltage existing between the electrode holder and the ground during the off-arc or no-load period is the open-circuit voltage of the welder, and the operator can become exposed to this voltage while changing electrodes, setting up work, changing working position, etc., unless he is properly instructed and uses the equipment provided for his protection.

The load voltage at the arc during welding is lower (20 to 35 volts) and is not the primary concern.

The open-circuit voltages, either d-c or a-c, required for satisfactory welding are low by comparisons with other industrial voltages and normally would not cause injury or severe shock. But the very fact that they are low may lead to carelessness.

The danger of shock is particularly marked in hot weather when the operator is sweaty, or when he is wet. The weldor should develop the habit of always keeping his body insulated from both the work and the metal electrode and holder. Particularly, he should never permit the bare metal of an electrode, the electrode insulation or any metal part of the electrode holder to touch either his bare skin or any wet covering on his body. Consistent use of well insulated electrode holders, well insulated cables, dry protective coverings on the hands and body, and insulation from ground will be helpful in avoiding contact. Because contact with an electrode at one time has not proved harmful it should never be assumed that contacts at other times will be similarly harmless.

Partially used electrodes should be removed from holders after welding. The operator should have a place to lay down his holder or hang it up when not in use so that it will not come in contact with persons or conducting objects.

What Are Safe Voltages?

In the interests of safety, the NEMA standards establish the maximum open-circuit voltage for industrial a-c welders at 80 volts for manual welding and 100 volts for machine welding. The ASA code previously referred to names 100 volts for single-operator d-c welders, 80 volts for a-c welders used on manual welding and 100 volts for a-c welders used on machine welding as the maxima for open-circuit voltages.

The above figures are rms values and are not set as safe values but as maximum values which need not be exceeded in good welding practice with all types of commercial electrodes. In fact, some types of electrodes are very satisfactory for operating at much lower open-circuit voltages, and some welders are designed to operate at open-circuit voltages substantially lower.

Rapid expansion in the use of a-c welders has brought up the usual questions and discussions as to whether a-c is more hazardous than d-c voltages used in welding. Investigations made by Dalziel and Lagan and published in the March, 1941, issue of *Electrical West* under the title, "Practical Aspects of Electrical Shock," provide authoritative basic data on this subject.

Basing conclusions on values determined by these investigators, an upper limit of 3 to 6 volts would be considered a safe voltage for 60 cycle a-c and about 10 times these values safe upper limits for d-c under conditions of body resistance reduced to a minimum of 400 to 600 ohms.

Current and not voltage is the factor that causes shock and injury. Current through the body is limited by contact and skin resistance and body impedance. The resistance of dry skin may be as high as 100,000 ohms per square centimeter, but body, skin and contact resistance may drop to as low as 1,000 ohms when hands are wet and feet in water.

These limits emphasize the fact that there is no such thing as safe voltages satisfactory for arc welding, considering the worst conditions of reduced skin and contact resistance.

Although it can be stated that the voltages used in welding under normal operating conditions are not hazardous, it is highly important to instruct operators on how to help keep conditions normal through the use of good cables, well insulated holders and fittings, dry protective gloves and clothing.

For further protection under special conditions, a-c welders are available with automatic open-circuit voltage controls. These models automatically reduce the open-circuit voltage to approximately 30 volts when the arc is broken and restore the normal open-circuit voltage by contacting the electrode to the work upon resumption of welding. The controls are perfected to the point where there is no interference with the welding operation and are recommended for use on outdoor welders where operators may be working on wet steel or where welding is carried on in confined areas or small compartments. Under these conditions, the difficulty of keeping dry from weather conditions or from perspiration is greater, and there is greater

probability of the operator getting across the open-circuit voltage because of the restricted space conditions.

Eye Protection

The personal protection of the operator from the radiant energy of the arc and from burns from spatter requires suitable helmets with protective filter lenses, protective gloves and other protective clothing such as sleeves, capes, aprons and leggings, etc. Except for light work, flameproof gauntlet-type gloves should be worn.

Helmets or face shields should be used on all welding operations, and care must be exercised to keep them in good condition. The helmet is primarily for the use of the operator; the use of face shields should be confined to inspectors or others who might have occasion to watch the welding.

Operators working close together or other workmen who might be in the immediate vicinity of an operator's arc should be protected by screens. I have not seen any rules governing this point, and shop conditions are so varied that fixed rules would be difficult to set. Conditions should be observed, and corrective action taken if there are indications of trouble.

Goggles, clear or tinted, should be worn by operators, inspectors or other spectators in the vicinity when welds are being chipped or cleaned. Suitable goggles must also be worn during gas welding.

Protective equipment for the eyes, face and head should conform to the American Standard Safety Code for Protection of Heads, Eyes and Respiratory Organs. Protective clothing is covered in the American Standard Specification for Protective Occupational Clothing, L18.

Harmful Welding Fumes

Under certain conditions of welding, health hazards due to gases, fumes or dusts may exist. These possible hazards are not serious except when operating in spaces not properly ventilated and are almost entirely due to the presence of gases, dusts and fumes containing lead, zinc, cadmium, fluorine, or compounds thereof, or to the possible formation of oxides of nitrogen. When such a hazard is present, sufficient ventilation or individual respiratory protection must be provided.

Harmful fumes or gases would be present when an operator is welding or cutting lead, lead-bearing steel or steel coated with lead-bearing paint. Zinc fumes would be present when working on galvanized steel, brasses or bronzes, or steel coated with zinc-bearing paint. Steel is frequently coated with cadmium to prevent corrosion, and the welding of such steel gives rise to cadmium-bearing fumes.

The coatings on stainless-steel electrodes contain compounds bearing fluorine. These compounds are extremely stable, and experimental work indicates that under ordinary conditions of use harmful amounts of fumes are not produced from stainless-steel welding; nevertheless, it is important that good ventilation be always provided when this class of welding is being carried on.

Some nitrous oxide is present in all welding. Harmful effects from this gas are not found, however, with the possible exception of welding done in extremely confined spaces without ventilation.

No fixed rules for ventilation have been established, but three cases should be considered:

1. Welding in open air—outside.
2. Welding indoors.
3. Welding in confined spaces.

Ventilation Requirements

The following brief recommendations applying to these three cases may be helpful:

1. Welding in the Open Air. Positive ventilating devices for fume removal or respiratory protective equipment are not required in welding operations conducted in the open air unless the operator is engaged in welding or cutting lead or cadmium-coated metals or metals covered with lead, mercury or cadmium-bearing paint. Local exhaust ventilation can then be used to draw the fumes away from the operator, or respirators can be worn. Respirators are relatively inexpensive and provide good protection.

2. Indoor Welding. For continuous welding operations, in industrial practice, it is generally considered that if an operator has less than 10,000 cu ft of space allowance, ventilating fans which will assure three to four changes of air per hour should be installed in the area.

For less extensive, intermittent or even occasional welding in small shops, care should be taken to see that open windows, doors or roof vents provide air changes. If this cannot be arranged, an exhaust fan should be installed.

Positive ventilation, such as an air suction line, should be provided to exhaust the fumes arising from welding or cutting metals containing or coated with lead, zinc, cadmium or mercury.

3. Operations in Confined Spaces. All welding or cutting operations carried on inside relatively small, enclosed or restricted spaces such as tanks, boilers or pressure vessels must be adequately ventilated by forced ventilation.

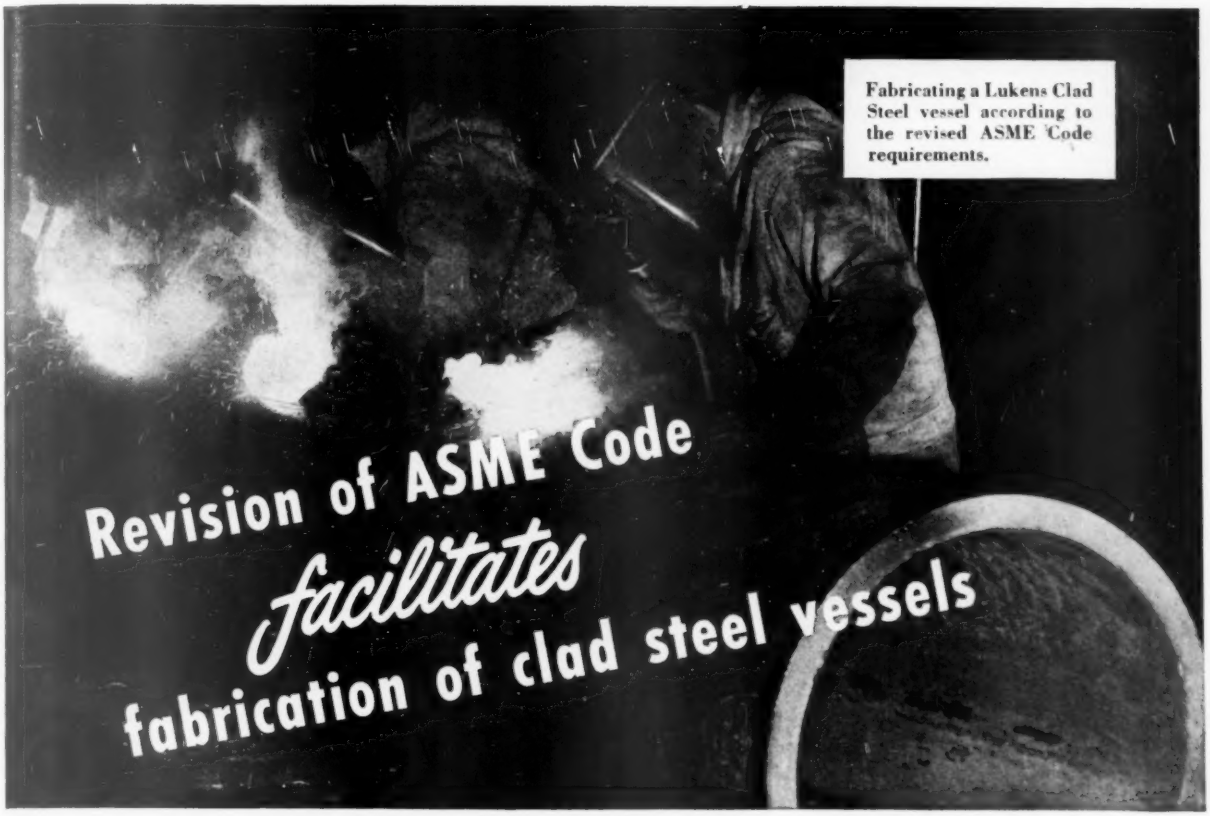
The numerous investigations and studies which have been made over a period of years show that permanent harmful effects on the operator's health are not experienced in the course of ordinary welding operations, and that ventilation can readily be provided to take care of the conditions which require it.

Fire Protection

Production welding operations are normally carried on in regularly authorized shop areas. These should be kept free from combustible materials, oil, grease, waste, etc. Welding construction or maintenance operations carried on outside authorized areas should not be started until authorized by the person or persons to whom such authority has been delegated by the management. It is good practice to supply fire extinguishers as part of the welding equipment for welders used in such "out-of-bounds" operations.

If combustible material has been exposed to sparks or heat from welding, a watcher should remain on the job for at least 30 minutes after completion of the work to make sure that no smoldering fires have been started.

Many users of welding equipment have found it helpful and worthwhile to issue rules and recommendations covering safe operating practices applying to overall operations as well as to personal protective equipment of the operator. These may range from plain printed cards to illustrated pamphlets. Publications of this type surely do their part in accident prevention.



Fabricating a Lukens Clad Steel vessel according to the revised ASME Code requirements.

As announced recently in Mechanical Engineering, Case 896 of the ASME Code has been further revised. Rulings cover welding procedure and operator qualification requirements, with the result that, in many cases, the fabrication of clad steel equipment is facilitated and speeded up.

All-alloy welds can be used throughout the entire section of a clad steel shell where the small diameter, for example, makes this necessary. Materials meeting Specification SA-263, Grade A (Type 410) can be used without stress relief if the carbon content of the cladding is less than 0.08. Temperature limitations for certain types of clad metals have been modified.

Case 1078, covering the use of linings which are applicable to certain fittings—manways, nozzles and the like—is also now available for the first time.

For general information on Lukens Nickel-Clad, Stainless-Clad, Inconel-Clad and Monel-Clad Steels, write for Bulletins 255 and 338. Lukens Steel Company, 416 Lukens Building, Coatesville, Pennsylvania.

CLAD METAL STEEL

LUKENS

Nickel-Clad Stainless-Clad
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STEELS

SOLID METAL ADVANTAGES WITH CLAD STEEL ECONOMY

• • SPEED SCRAP TO THE MILLS TO MAKE MORE STEEL • •

Prepares Big Program

No little plans are those of the American Weldment Manufacturers Ass'n. Its current program includes the setting of standards of manufacture, an informational booklet and a job-costing procedure

BY CLYDE B. CLASON

PRINTED in white against a dark background, the four capital letters "A.W.M.A." will soon appear in many publication advertisements and sales literature as the official insignia of the American Weldment Manufacturers Association. Member companies are encouraged to use the striking emblem reproduced herewith, which was adopted at the last business meeting, held Jan. 5 and 6 at the Hotel Moraine in Highland Park, Ill.

New Members Wanted

A drive for new members will soon be inaugurated, it was announced by President William Simpson. The present 16 member companies are confined to a belt in our country's northern section extending from Coatesville, Pa., on the east to St. Louis in the midwest. It is desired to secure representation in the South, Gulf States, Rocky Mountain, New England and Pacific Coast regions; however, no geographical restrictions are placed on membership. Any firm in the United States or Canada is eligible to join the association provided that it does some outside welding for production (as distinguished from maintenance) purposes.

A new class of associate members has also been created. All individuals, firms or corporations who are either suppliers or are in some other way interested in the development and advancement of the weldment industry are eligible for nomination. This class of members will be invited to all meetings and may take part in discussions but will have no voting power.

There will be two more meetings of the AWMA this year: a business meeting in April, time and place to be later announced, and the annual fall meeting, which will feature technical papers prepared by members and associates.

Officers and Directors

William C. Simpson, manager of sales for Lukenweld Division of Lukens Steel Co., Coatesville, Pa., is president of AWMA for the current term. Other officers are Hugh Hodges, Graver Tank & Mfg. Co., East Chicago, Ill., secretary, and A. S. Fredrickson, Lakeside Bridge & Steel Co., Milwaukee, treasurer. These three officers constitute an executive committee to function for management purposes between meetings of members or meetings of the board of directors.

The seven directors include the three officers and four other members: Walter G. Koch, International Steel Co., Evansville, Ind.; Sylvester V. Williams, Struthers Wells Co., Titusville, Pa.; Louis T. Kenney, United Welding Co., Middletown, O., and Charles Stewart, A. C. Woods & Co., Rockford, Ill.

At present the association has no vice-president, but its constitution provides for such an office and one will be elected at an early meeting.

Other Members

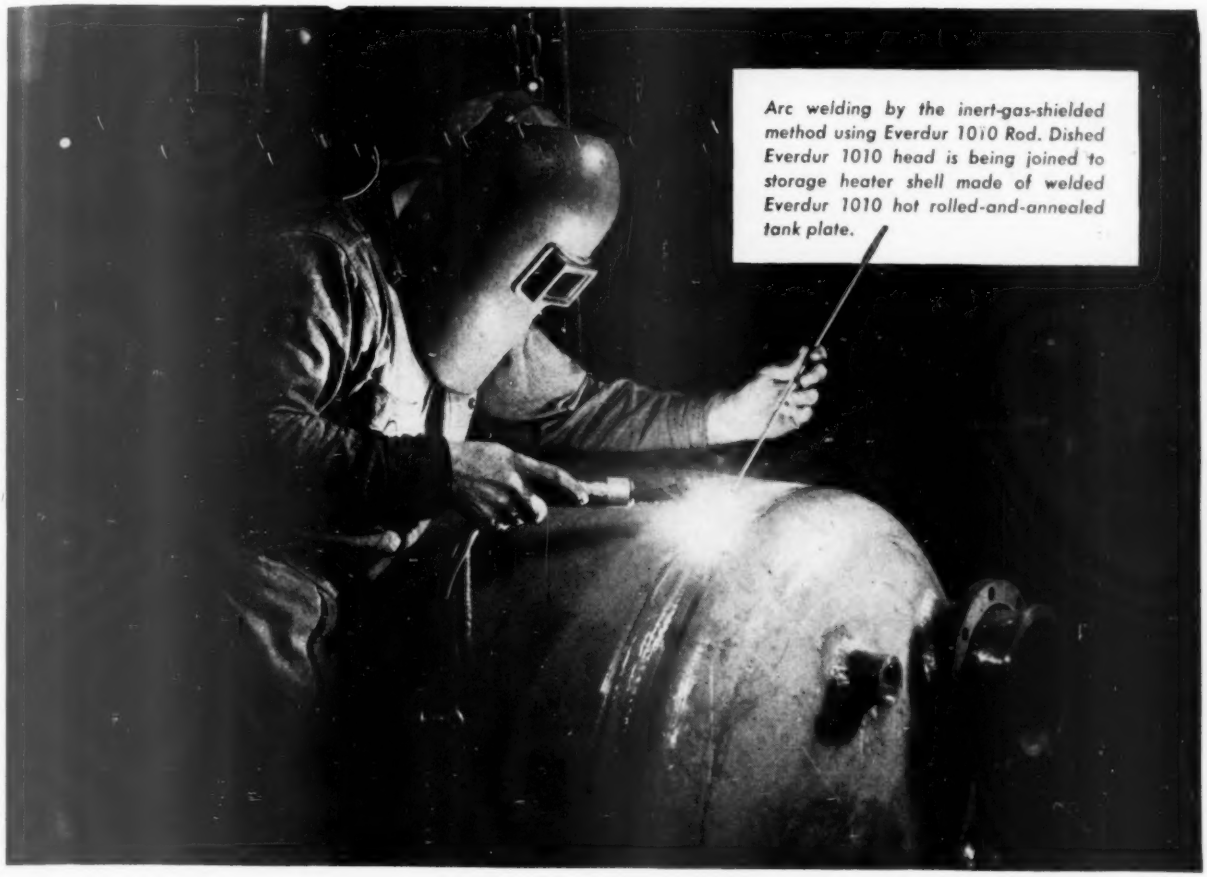
In addition to all of the companies named above, membership now includes: American Welding & Manufacturing Co., Warren, O.; Berlin Chapman Co., Berlin, Wisc.; Consolidated Welding and Engineering Co., Chicago; Dube Manufacturing Co., Chicago; Falk Corp., Milwaukee; Pandjiris Weldment Co., St. Louis; Optenberg Iron Works, Sheboygan, Wisc.; Renner Mfg. Co., Milwaukee, and Van Dorn Iron Works, Cleveland.

WILLIAM C. SIMPSON, president, American Weldment Mfrs. Ass'n.

The Byrne Marcellus Co., Chicago, has been appointed to act as manager of the association for a period of at least one year. R. D. Wisener, of Byrne Marcellus, is account executive handling AWMA activities. General offices of the American Weldment Manufacturers Association are located at 332 So. Michigan Ave., Chicago 4.

Projects in Prospect

Several important activities were inaugurated at the January business meeting. One of these is the preparation and development of a promotional booklet aimed to dramatize the weldment industry. This booklet will be both technically authentic and comprehensive. In print and picture, it will present a brief history of the industry and outline its present scope and magnitude. Selected pictures of typical weldments and welded products will be shown, together with explanations of why welding was selected as the means of fabrication.



Arc welding by the inert-gas-shielded method using Everdur 1010 Rod. Dished Everdur 1010 head is being joined to storage heater shell made of welded Everdur 1010 hot rolled-and-annealed tank plate.

IF YOU WANT WELDED, CORROSION RESISTING EQUIPMENT

consider Everdur Alloys

IN ADDITION to rust immunity, high corrosion resistance and high strength, Everdur* Copper-Silicon Alloys have unique fabricating advantages. Everdur 1010 is readily welded with Everdur 1010 Rod by oxy-acetylene and carbon arc methods, and also inert-gas-shielded arc welding.

Everdur 1010 is supplied in practically all commercial forms, and one of its widest uses is for welded pressure vessels and other storage and processing equipment.

Everdur 1015 is furnished for severe cold working fabrication and has about the same welding characteristics as 1010.

Everdur 1000, furnished only in ingots for re-melting, has good welding properties.

For any equipment made of strong, corrosion resisting metal, investigate Everdur Metal—a group of remarkably workable copper-silicon alloys. Anaconda Publication E-5 gives physical properties and applications.

*Reg. U. S. Pat. Off. 48162

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Everdur

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Subsidiary of Anaconda Copper Mining Company

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New Toronto, Ont.

Multi-Pic is the improved weld hammer with 5 separate pic-pointed tool steel heads locked between free floating guide plates. Each single stroke of **Multi-Pic** gives five surface cleaning blows. The five picks adjust themselves automatically to the varied surface of any concave, convex or irregular shaped weld and clean quickly, easily, with fewer blows. Pic points are hardened, tempered tool steel which lasts indefinitely and can be resharpened.

Repeater Brush whisks away loosened slag, oxides and rust in a jiffy. The unique design makes it easy to reach into the deepest corners and crevices. The crimped oil hardened wire brush is provided with five quick and simple adjustments to compensate for wear and lasts five times as long as an ordinary brush.

Multi-Pic is supplied with double 5-pic pointed ends or with dual 5-pic and 25-pic pointed ends as illustated with or without the Repeater Brush. Extra Brushes—three in a carton.

ORDER FROM YOUR DEALER TODAY!

Try **Multi-Pic** in your own shop—on your own work. You'll welcome the quick, cleaner work of this new weld hammer which follows the contour.
If your dealer cannot supply you, write us for descriptive folder and name of nearest supply house.

Patents Pending.

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741-743 East 71st Street • Chicago 19, Illinois

Also on the AWMA program is the establishment of recommended standards and practices of weldment manufacturing. This is expected to cover standards relating to steel specifications; standards of welding and weld sizes; overall tolerances or any special or close tolerances; finishing by sand, steel grit or shot blasting; stress relieving; chipping and grinding; inspection including X-ray, supersonic, gamma-ray and magnetic-particle inspection methods.

Job-Costing Procedure

Also to be developed by the association is a cost manual which will present a statement of all essential elements of costing together with recommended job costing procedure. This manual will set forth the best cost thinking and the best costing practices within the industry combined with counsel received from a recognized professional cost consultant. After the preliminary draft has been prepared, hearings will be held to which executive and cost personnel of member companies will be invited to discuss and revise the text. When the manual is finally published, an educational program will be carried on among AWMA members on the recommended cost program, though it is understood that adoption and use of the recommendations contained in the manual are to lie wholly within the discretion and individual judgment of each member.

Committee Appointments

To carry out these extensive projects, four committees have been appointed. These and their chairmen are:

Manufacturing Standards and Practices: Walter G. Koch, International Steel Co., Evansville, Ind.

Public Relations and Advertising: D. W. Dawson, American Welding & Manufacturing Co., Warren, O.

Market Research: N. T. Jones, Van Dorn Iron Works, Cleveland.

Admission Standards: L. T. Kenney, United Welding Co., Middletown, O.

To summarize, this new organization has girded up its loins and is ready to go places. We predict that it will shortly make itself felt as a constructive force within the welding industry.

Powder-Cutting

Steps Up Production of Stainless Steel Castings 32 Times . . .

Riser cutting of centrifugally-cast stainless steel rings used to be a difficult and time-consuming job. In one foundry which used a boring machine, this operation took eight hours per casting. When powder-cutting was introduced, the time was reduced to approximately 15 minutes—a 32-fold increase in production.

In another foundry, powder-cutting was profitably used to remove ⅜ to 1 in. of metal from stainless steel castings. The machining cost for this type of work has been $24.00 per casting. Substitution of powder-cutting brought the overall cost, including finish-grinding and chipping, to $7.53 per casting, and reduced the time from 8 hours to 1 hour. For an order of 60 castings, the foundry saved $988.20 and 360 hours of operating time.

If you have stainless steel or other oxidation-resistant metals to cut,

Centrifugally-cast rings of stainless steel are cut in 15 minutes time, increasing production 32 times.

LINDE'S service engineers can show you how powder-cutting methods can be used with profit. Phone or write the nearest LINDE office.

Here, risers on stainless steel castings are being powder-cut—a time saving of 30 per cent over the former methods.

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Trade-Mark

THE LINDE AIR PRODUCTS COMPANY

Unit of Union Carbide and Carbon Corporation

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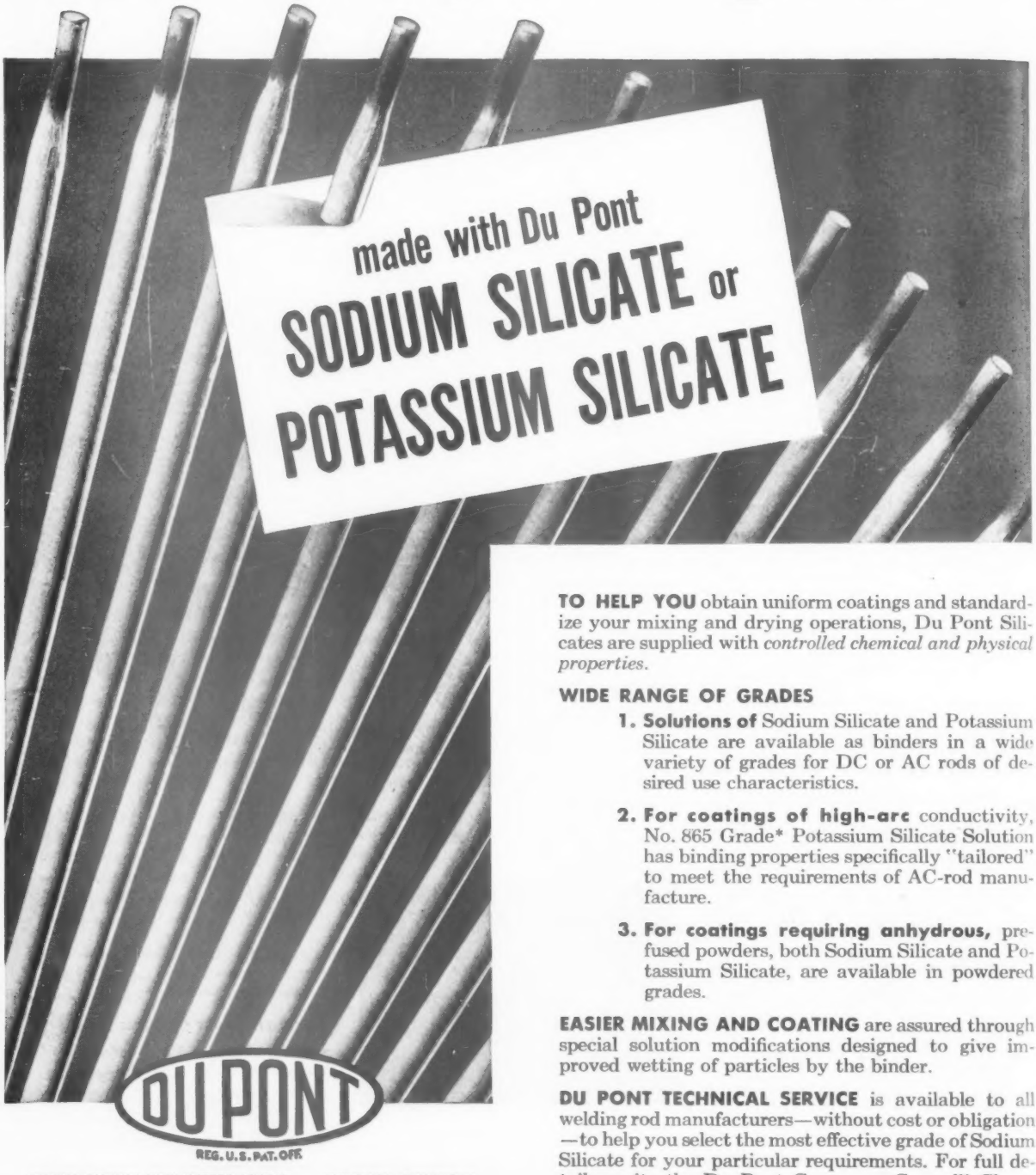
In Canada: DOMINION OXYGEN COMPANY, LIMITED, Toronto

The word "Linde" is a registered trade-mark of The Linde Air Products Company

Better Quality Welding Rods—



BETTER THINGS FOR BETTER LIVING . . . *THROUGH CHEMISTRY*

TO HELP YOU obtain uniform coatings and standardize your mixing and drying operations, Du Pont Silicates are supplied with *controlled chemical and physical properties.*

WIDE RANGE OF GRADES

1. **Solutions of** Sodium Silicate and Potassium Silicate are available as binders in a wide variety of grades for DC or AC rods of desired use characteristics.
2. **For coatings of high-arc** conductivity, No. 865 Grade* Potassium Silicate Solution has binding properties specifically "tailored" to meet the requirements of AC-rod manufacture.
3. **For coatings requiring anhydrous,** prefused powders, both Sodium Silicate and Potassium Silicate, are available in powdered grades.

EASIER MIXING AND COATING are assured through special solution modifications designed to give improved wetting of particles by the binder.

DU PONT TECHNICAL SERVICE is available to all welding rod manufacturers—without cost or obligation—to help you select the most effective grade of Sodium Silicate for your particular requirements. For full details, write the Du Pont Company, Grasselli Chemicals Dept., Wilmington 98, Delaware.

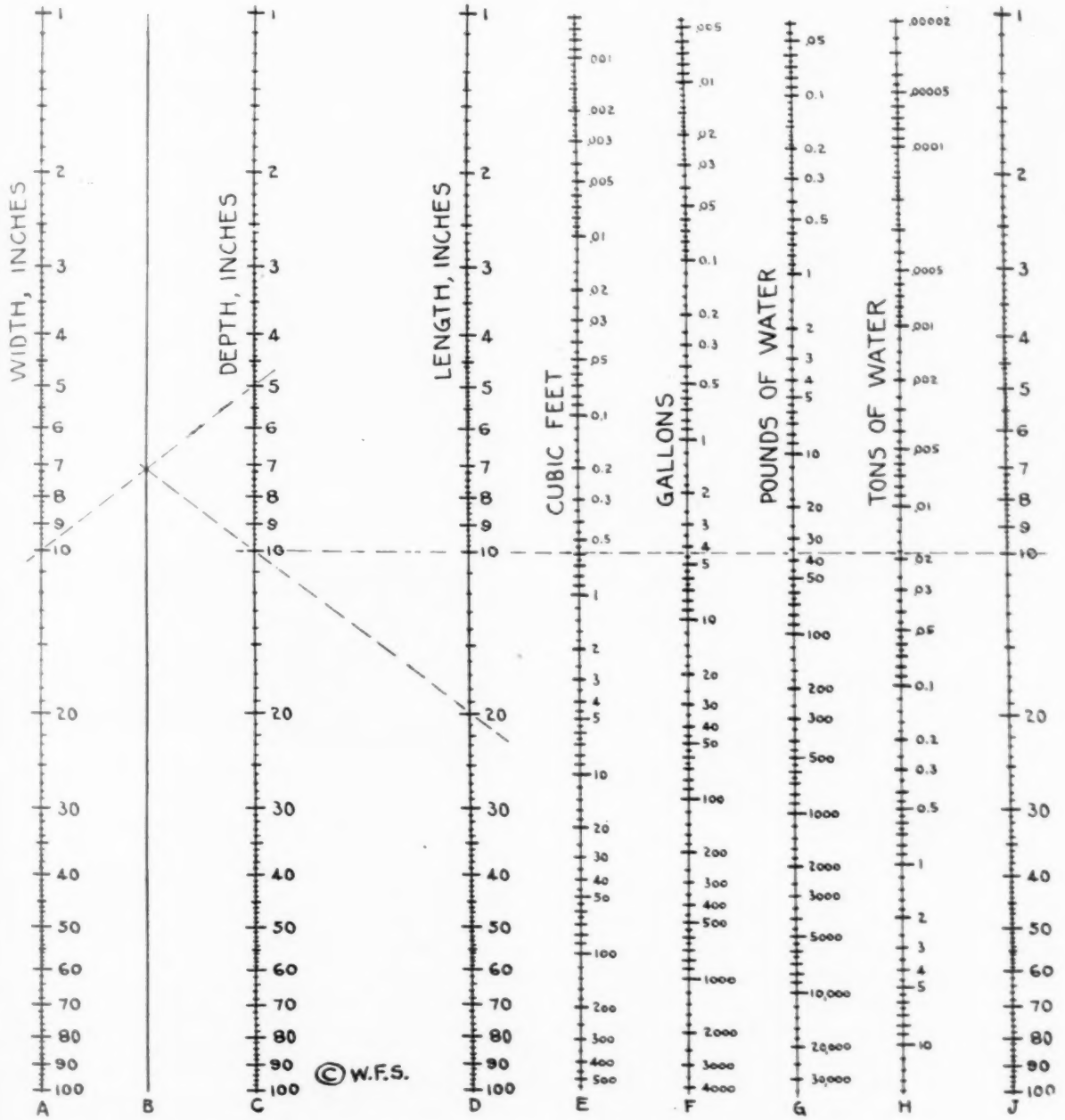
*Patented. U. S. No. 2,344,621, for use in welding rod manufacture.

For BETTER welding rods:

DU PONT SODIUM and POTASSIUM SILICATES

Capacities of Rectangular Tanks

BY W. F. SCHAPHORST, M.E.



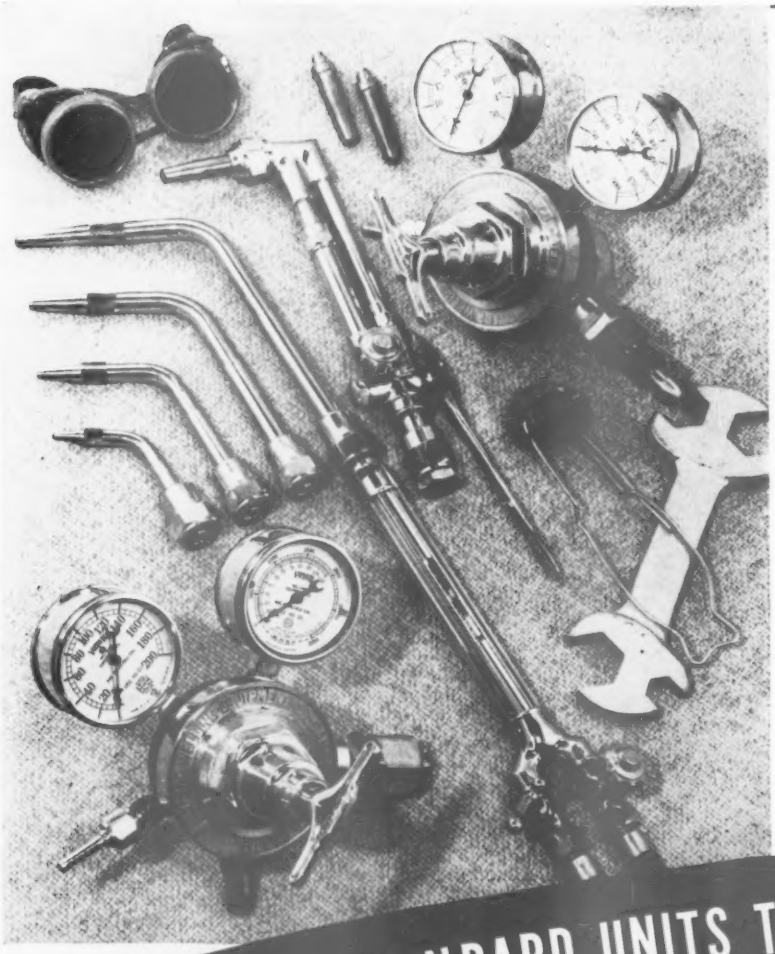
As a particular example in the use of the above chart, consider a rectangular tank that is 10 in. wide, 5 in. deep and 20 in. long. How many pounds of water will it hold?

The dimensions of the tank in inches are given in columns A, C and D. Find 10 in column A and 5 in column C; join these two points with a straight line and mark the intersection with blank column B. Join that point of intersection with 20 in column D and note new intersection with column C at point 10. Columns C and J are exactly alike so that perfectly horizontal lines can be drawn between corresponding points of these two columns. Simply run a straight line from 10 in column C to 10 in column J, and its intersection with columns E, F, G and H will give you all the answers, in this case as follows:

Column E: Tank has a volume of nearly 0.6 cu ft.

Column F: It holds about 4.3 gallons, which, if water, weigh about 37 pounds (*column G*) or (0.018) tons (*column H*).

If the tank is designed to hold a liquid other than water, multiply the weight in pounds of water, as found in column G, by the density of the particular liquid. Thus for oil of density 0.9, we would have 37 lb × 0.9 = 33.3 lb.



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REGULATORS for
- acetylene
- carbon dioxide
- compressed air
- hydrogen
- liquid pet. gases
- medical gases
- oxygen

TORCHES for
- air gas
- brazing
- bunsen burner
- descaling
- flame cutting
- flame hardening
- hand cutting
- heating
- lead burning
- machine cutting
- preheating
- soldering
- surface hardening
- welding

USE VICTOR STANDARD UNITS TO CUSTOM-BUILD Your Welding and Cutting *Outfit*

CYLINDER MANIFOLDS for
- all types of cylinder gases

CYLINDER TRUCKS

EMERGENCY FLAME CUTTING OUTFITS

WRITE us now for descriptive literature and name of nearest distributor.

Assembling your welding and cutting outfit is simple and low-cost if you start with one of VICTOR's basic units, such as the WC-1 shown here. WC-1 handles all ordinary welding jobs and cuts metal up to 10″ thick. For flame cutting, descaling, multi-flame heating or other special work, you add just the VICTOR tips, nozzles, or attachments which your job requires.

VICTOR makes welding and cutting equipment for all types of work, from fine jewelry manufacture, to cutting armor plate. Ask your nearest VICTOR distributor to help you custom-build the outfit best suited to your needs NOW.

VICTOR
FOR WELDING

For welding and money-saving ideas,
see the VICTOR display
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VICTOR EQUIPMENT COMPANY
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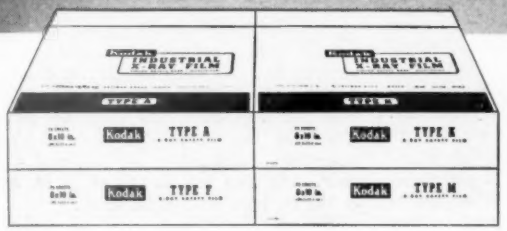
WHAT'S THE RIGHT X-RAY FILM?

ANSWER:



KODAK INDUSTRIAL X-RAY FILM, TYPE A

● To examine such a dense and thick material the radiographer takes advantage of Kodak Industrial X-ray Film, Type A. For, in order to keep exposure reasonably short, the high speed of this film is essential. At the same time, its high contrast and fine graininess enable him to take full advantage of the ability of the 1000 kv machine to detect weld irregularities.

A TYPE OF FILM FOR EVERY PROBLEM

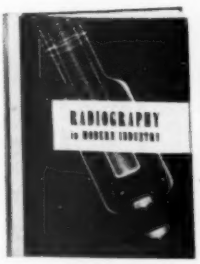
To provide the recording medium best suited to any combination of radiographic factors, Kodak produces four types of industrial x-ray film. They provide the means to check welds efficiently and thus extend the use of the welding process.

Type A—has high contrast with time-saving speed for study of light alloys at low voltage and for examining heavy parts at 1000 kv. Used direct or with lead-foil screens.

Type M—provides maximum radiographic sensitivity, under direct exposure or with lead-foil screens. It has extra-fine grain and, though speed is less than in Type A, it is adequate for light alloys at average kilovoltage and for much million-volt work.

Type F—provides the highest available speed and contrast when exposed with calcium tungstate intensifying screens. Has wide latitude with either x-rays or gamma rays, exposed directly or with lead screens.

Type K—has medium contrast with high speed. Designed for gamma ray and x-ray work where highest possible speed is needed at available kilovoltage without use of calcium tungstate screens.



RADIOGRAPHY IN MODERN INDUSTRY

A wealth of invaluable data on radiographic principles, practice, and technics. Profusely illustrated with photographs, colorful drawings, diagrams, and charts. Get your copy from your local x-ray dealer—price, $3.

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Radiography

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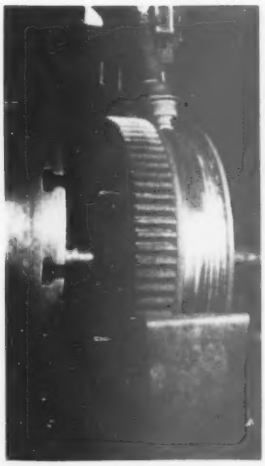
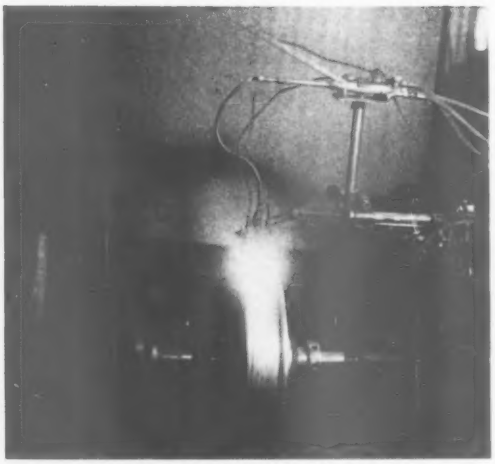


1—SUBMERGED-MELT builds up worn tread of crane wheel



Courtesy The Oxweld Railroad Service Co.

2—FLAME-HARDENING increases hardness of the deposit from 200 to 550 Brinell, provides a long-wearing surface

Rebuilding Crane Wheels

A WORN crane wheel may be rebuilt by submerged-melt welding at a fraction of the cost of a new wheel. When the added weld metal is flame-hardened, the resulting wearing surface lasts longer than the original.

In one shop the build-up is accomplished by mounting the wheel on a wheel lathe with the welding head suspended just above it (Fig. 1). The wheel is turned at a periphery speed of 15 ipm. Work is stopped after a complete revolution, and the head is indexed to start a deposit alongside the one just completed.

Electrical settings for a wheel of 0.28% carbon steel are 550 amp, 30 volts; 3/16-in. welding wire is used. The deposited metal is about 7/16 in. wide by 3/16 in. deep and has an as-deposited hardness of 200 Brinell. By tilting the welding head, the bead is run the desired distance on the side of the flanges. Excess metal is turned off with the same lathe on which welding is done.

The wheel is flame-hardened by the progressive heat-and-quench method. A fractional horsepower motor turns the wheel at a speed of 6 ipm under the oxy-acetylene flames and water quench (Fig. 2). The heating head is a standard 30-flame type with tips of No. 26 drill size (0.147 in.). The width of the flame pattern is sufficient to harden the flanges as well as the tread. The flame-hardened surface tests 550 Brinell.

When these wheels were built up manually by arc welding, it was necessary to anneal them before welding to obtain a good surface and to postheat them to soften the manually deposited metal for machining. Both preweld and postweld annealing are eliminated. The method cuts total reconditioning time per wheel from 22 to 6 hours and the amount of electrodes consumed from 40 to 22 lb.

Worn Diesel Valves Reclaimed

A LARGE Northwest railroad reclaims valves for Diesel locomotives by building up worn areas with a cast non-ferrous hard-facing alloy applied by means of the oxyacetylene torch. The procedure is described by J. W. Kenefic and R. E. Barber, railroad sales representatives of Air Reduction Sales Co.

The valves are first thoroughly cleaned. The flame is applied as horizontally as possible to the valve perimeter, care being taken to keep it away from the stem. If the stem is to be metal sprayed, the latter precaution is not so important. Hard-facing of one valve consumes about 4 to 6 rods. After rebuilding, the valve is centered in a lathe and trued up. The seat is machined almost to size and then finished in a valve-grinding machine.

Worn stems are corrected by metal spraying. The valve is centered in the lathe, and the stem turned down about 0.025 in. The surface is roughened with a knurling tool and sprayed with 0.80% carbon steel. The stem is then machined .o size.

The entire job takes about five hours, and the hard-faced reclamation triples valve life at less than a fourth the cost of a new valve.

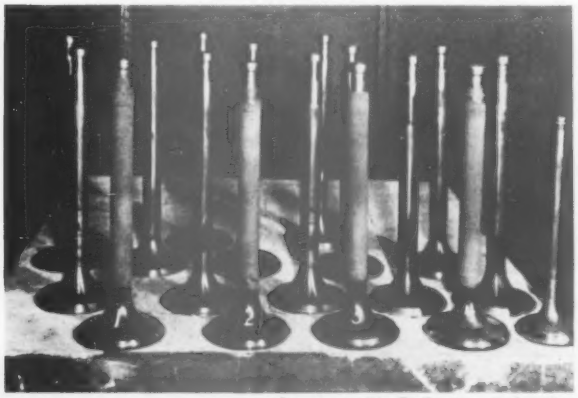
* * *

Cracked Die Ring Salvaged

AN AUTOMATIC four-operation press in an Ohio automotive manufacturing plant broke down when the die ring cracked in three places. The press operates at 350 tons per impression. To stand up under this force, the die ring is made of high-chromium, high-carbon air-hardened tool steel. The ring has an OD of 16 in. and is 3½ in. high by 3½ in. thick.

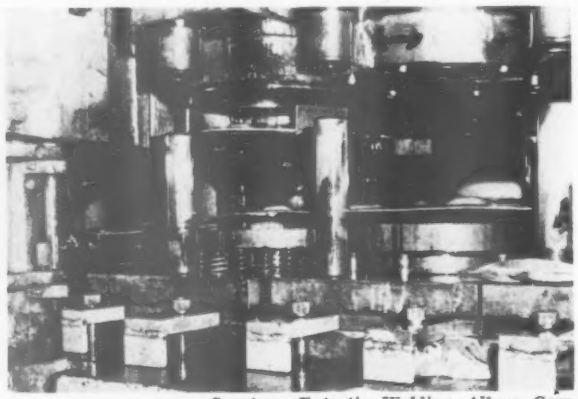
The tool department could not make a new die for the press in under three weeks. To avoid this delay in production, it was decided to join the breaks by low-temperature welding. A low-melting, copper-base alloy of high-tensile strength was selected, some two pounds of electrodes being consumed. The die was restored to service at the end of 12 hours, and it has since produced over 700,000 plates.

In making the repair, the broken edges were ground out and lined up on the sur-



Courtesy Air Reduction Sales Co.

HARD-FACING and metallizing are combined for Diesel valves. Perimeter is built up with hard-facing alloy, stem with sprayed steel



Courtesy Eutectic Welding Alloys Corp.

BROKEN DIE RING, made of air-hardened tool steel, was salvaged by low-temperature welding. The three breaks are shown by the arrows

face plate; they were found to be 0.005 in. off at the point of the worst break. The entire ring was preheated below 500 F, one inch from the weld area, and fluxed before the sides were tinned. Each break was completed before proceeding with the next. The finished die was only 0.003 in. oversize, and the excess was easily ground off. Stresses were then relieved by post-heating the ring to 400 F for a short while.

* * *

Courtesy Nelson Stud Welding Div., Morton-Gregory Corp., Lorain, O.

STREAMLINED new plant of Sunshine Biscuits, Dayton. Studs secure the corrugated siding to the struts supporting side wall

Stud-Welded Siding

CORRUGATED sheet asbestos (Transite) introduces a distinctive streamlined effect to the new factory addition of Sunshine Biscuits, Inc., Dayton, O., by forming continuous bands around the side walls between the several unbroken rows of projected steel sash (see picture).

More than 400 squares of asbestos are secured by means of studs end welded to the steel struts supporting the siding. Insulation is provided by 1-in. panels of insulating board surfaced on the inside with ⅛-in. veneer. Sheets of 15-lb asbestos felt were wrapped in a U-shape around the bottom of these insulating panels to form a seal on the inside, the outside and the bottom. The panel was set into a layer of calking putty, and the corrugated asbestos sheets were placed on the outside in the same bed of putty. Holes were drilled through the asbestos and insulating material at regular intervals to facilitate installation of the studs, which were applied by means of an automatic stud-welding gun to the structural supports. Standard roofing nuts equipped with integral washers secure the siding in place.

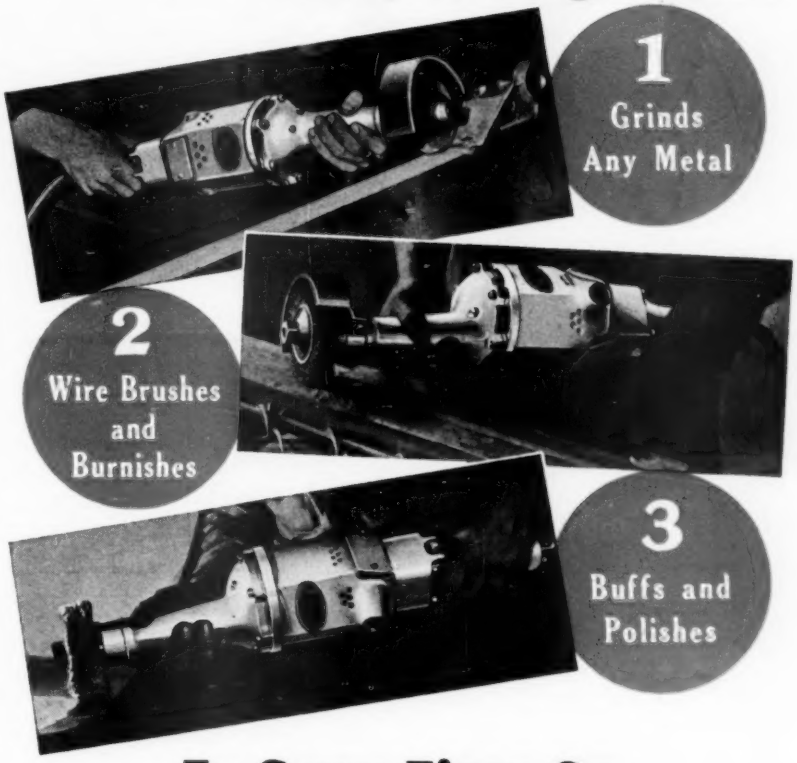
The method of installation was developed by the architectural and engineering staff of Sunshine Biscuits, Inc., under the direction of M. C. Haley, chief architect and engineer.

* * *

Welded Pickling Hooks

SIX hairpin pickling hooks weighing 1,272 lb each were recently fabricated by the Youngstown Welding and Engineering Co., Youngstown, O., for the pickling of wire and cable. Each of these welded hooks is capable of carrying a load up to 4,200 lb. The hook parts were made of heavy Monel plate, and the round supporting members of steel. The latter were covered with a welded-on jacket of 14-gauge Monel to resist acid corrosion.

Use This *Powerful* GRINDER 3 WAYS



To Save Time On Many Welding Jobs!

Van Dorn Portable Electric Grinders can shave hours off your welding jobs . . . and save money and muscle, too! 1. They prepare surfaces for welding by "V-ing out," removing rust, scale, oxidation, old paint. 2. They smooth welds by removing excess metal. 3. They clean and buff surfaces for finishing.

Ask your nearby Van Dorn Distributor for full information on these time-saving tools. Send for our free catalog for details on Portable Electric Grinders and many other Portable Electric Tools for metal working. Address: The Van Dorn Electric Tool Co., 734 Joppa Road, Towson 4, Maryland.

Better Brushes!

Van Dorn "Whirlwind"* Wire Brushes have each tuft locked in to stay! That means they're tougher, denser, last longer. Six wheel sizes: 4″ to 12″. Three wire sizes. Three wheel thicknesses.

FOR POWER SPECIFY

*Trade Mark Reg. U. S. Pat. Off.

"Van Dorn"

(DIV. OF BLACK & DECKER MFG. CO.)

PORTABLE ELECTRIC TOOLS

Cast iron tractor yoke welded with TITAN Manganese Bronze.

The broken teeth on this cast iron gear were built up with TITAN Manganese Bronze. No further difficulty was experienced.

In Repair Welding...

only **BRONZE** offers all of these advantages:

✔ *Can be applied to a wide range of materials*

Mild steel—Cast steel—High and low carbon steel—Wrought iron—Cast iron—Malleable iron castings—Chrome and nickel cast iron—Brass—Bronze—Copper—and many others.

✔ *Easily and quickly applied*

Uniform and easy tinning.
Pre-heating or post-heating for stress relief are not necessary.
Low melting point.
Pre-cleaning can be eliminated with certain types of rods.
Bronze welds are easily machined.

✔ *Bronze welds are dependable in service*

Superior bonding properties.
High strength.
Excellent wear resistance (to reasonably hot or cold pressures).
Corrosion resistant.

TITAN Bronze Welding Rods are double deoxidized by an exclusive patented process to assure ductile, high-strength, non-porous welds. Write for literature today.

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Quality Alloys by Brass Specialists

Brass and Bronze Rod · Forgings · Die Castings · Welding Rods

Courtesy The Linde Air Products Co.

BUBBLE in spirit level ("A") is centered by adjusting speed of the welding carriage

Spirit Level Positions Carriage

It is important in submerged-melt welding to keep the fluid weld puddle close to the horizontal position. When inside girth seams on tanks and pressure vessels are welded, the welding wire is set ahead of the low point in order that the puddle will form at the bottom of the curvature and start to solidify while the surface is still horizontal.

A small spirit level fastened to the carriage of a welding machine provides an easy method for checking the position of the wire. The operator merely looks at the level ("A" in the accompanying picture) and adjusts the speed of the carriage so that the bubble remains centered. By thus matching the speed of the carriage with the rotation of the tank, the welding wire is always kept at the proper lead distance. The rack and pinion ("B" in picture) make it possible to position the welding head over the seam easily.

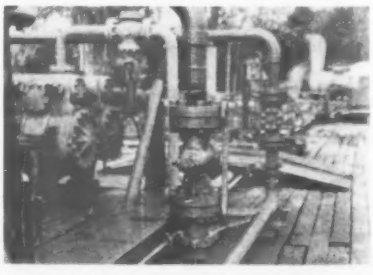
* * *

Wrench Hanger

By Elton Sterrett

Vibration in a high-pressure air line made it hazardous to leave a wrench on the square of the quick-acting cut-off valve. It was, however, imperative that the valve be operated instantly in case of emergency, which could not be done unless a wrench was handy.

The weldor steered between the horns of the dilemma by welding a wide, flat hook to the companion flange above the valve body. Suspended from the welded hook by the square aperture in its end, a wrench is now always available at an instant's notice yet is well out of the way.



CUT-OFF VALVE wrench is suspended on a hook welded to companion flange above valve

30 YEARS AGO

(From THE WELDING ENGINEER of March, 1919)

FIRST meeting of the newly formed American Welding Society will be held Friday, March 28, 1919, at the Engineering Societies Building, 33 West 39th St., in New York City. The Welding Committee of the Emergency Fleet Corporation and the National Welding Council have been merged to join the society. Among charter members are: Comfort A. Adams, president of The American Institute of Electrical Engineers; J. H. Deppeler, Metal & Thermit Corp.; E. H. Ewertz, Bethlehem Shipbuilding Corp.; and James F. Lincoln, Lincoln Electric Co.

* * *

JOHN HARRIS, of Harris Calorific Co., Cleveland, O., reported an attempt by safecrackers to rifle the company safe of $11,600 in Liberty bonds, cash and war savings stamps. The robbers used a carbon-hydrogen cutting torch to cut through a steel door leading to the office and to cut the combinations from a safe and strongbox. Though they succeed in opening the strongbox, which contained only records, they did not get into the safe; the approach of daylight apparently scared them away. The steel box and safe were still hot when employees entered the building at 6 a. m.

* * *

ELMER H. SMITH, president of Smith's Inventions, Inc., Minneapolis, has written a strong letter to the editor urging that definite standards be adopted for hiring weldors. He claims that many men can fuse metal or melt it but very few can be called qualified weldors. He suggests that industry set up standards for examining weldors or should persuade state legislatures to take charge of the situation. Mr. Smith makes the point that an engineer cannot take over a locomotive with "seven years" (apprentice period) of experience on traction engines, but that a "weldor" with seven years of experience can repair vital parts of the same locomotive.

* * *

THE Gas Products Co., Columbus, O., has been organized. Officers are: George S. Butler, president; Stanley D. Winger, vice-president and general manager; John R. Gobey, secretary-treasurer.

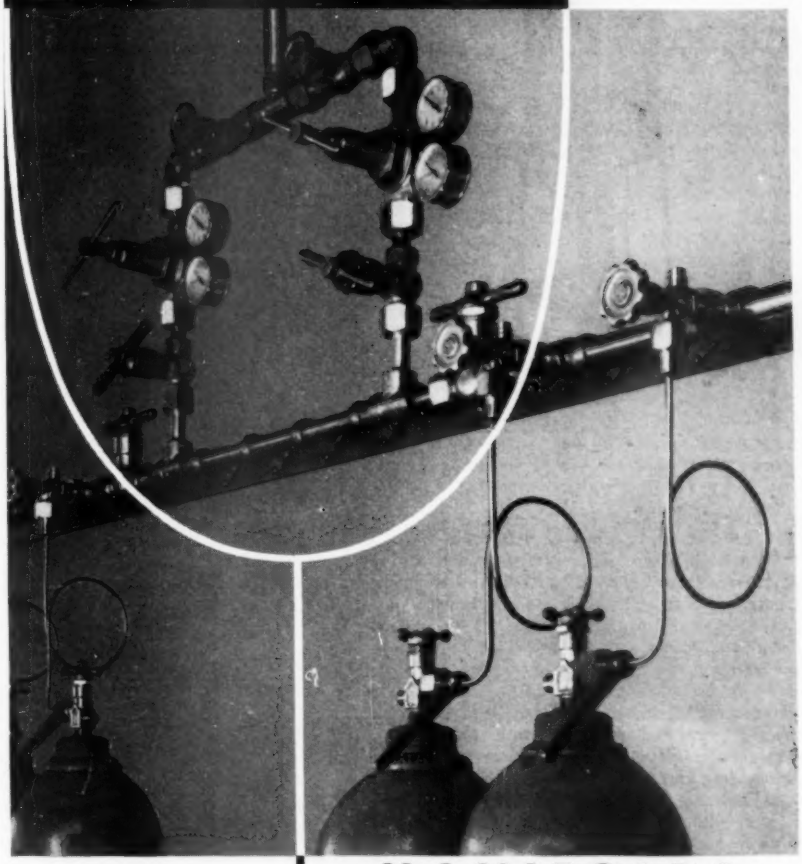
* * *

NORTHWESTERN Automotive Show on February 15, 1919, at Minneapolis was a glowing success. Manufacturers in the oxy-acetylene industry had one of the largest display booths at the show. A model of a "lady weldor" was featured in the booth as was a small scale model of a locomotive fabricated by welding.

* * *

TROUBLES with government red tape are appearing. Government payment on some war contract welding is being held up because inspecting officers have ruled that all oxygen, acetylene and charcoal (for preheat) cannot be charged because the finished work contains no part of them.

REGO*



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and other high pressure gases

Write for 24 page catalog giving complete specifications.

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Rugged construction and precision control equipment give RegO manifolds long life, safe performance and low maintenance.

Continuous Operation . . . Shut-off valve at each cylinder station permits removal of any cylinder without shuting down entire side of manifold. Master valves control each bank of cylinders.

Unit Construction . . . Header consists of steel I-beam, extra heavy brass pipe and fittings, cylinder station and master shut-off valves . . . *with all permanent connections silver brazed.*

Precision Regulation . . . Uniform delivery pressure is assured by dual large capacity two-stage RegOlators.

REGO

*Reg. U. S. Pat. Office

The BASTIAN-BLESSING Company
4201 Peterson Ave. Chicago 30, Ill.

Pioneer and Leader in the Design and Manufacture of Precision Equipment for Using and Controlling High Pressure Gases

New Products to Use

SPOT AND ARC welding may be done with Delta "Dual-Weld." Arc welding capacity is 120 amp; spot weld rating is 5 kva

Arc-Spot Welder

LIGHT-DUTY production spot welding and intermittent arc welding may both be done with the Delta "Dual-Weld" combination welder. The same welding transformer is used for both purposes. The complete package includes a 120-amp arc welder and a bench-type, foot-operated spot welder for single-phase a-c transformer coil is wound with double-glass-covered wire and protected with glass-mica-glass insulation and fiber glass tape. Arc-welding current may be adjusted from 0 to 120 amp. Rating for spot welding is 5 kva with 230-volt, 60-cycle current. Fully enclosed in a ventilated steel cabinet. The welding unit is furnished with foot lever and two ¾-in. solid electrodes for replaceable spot-welding tips, steel stand, welding and power cable; ground clamp and electrode holder are extra. DELTA MFG. DIVISION, ROCKWELL MFG. CO., 600 East Vienna Ave., Milwaukee 1.

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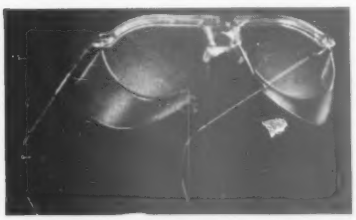


SEMI-CUP lens design gives nearly full protection while leaving a slit for ventilation

Spectacle-Type Goggles

SEMI-CUP lens design on "Tuc-Away" spectacle-type goggles for grinding and chipping is said to afford the wearer 92 to 96% protection. Sides and bottom are fully protected, but a narrow opening is left at the brow to eliminate fogging. The lenses are made of optical plastic and come in clear, light green, medium green and dark green shades. The metal temple telescopes to fit any head size. Entire goggle weighs less than ⅝ oz. WATCHEMOKET OPTICAL CO., INC., Providence, R. I.

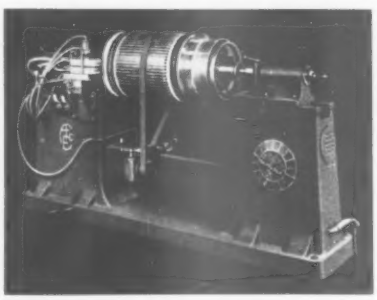
* * *

QUILTED sateen weldor's cap shields head and hair from sparks or metal particles

Weldor's Cap

MADE of quilted sateen, a new weldor's cap is said to provide protection against flying sparks, hot metal droplets and flying fragments. Other features are the heavy herringbone sweat band, double thick visor and reinforced top seams. LOUISVILLE CAP CO., Louisville 12, Ky.

* * *

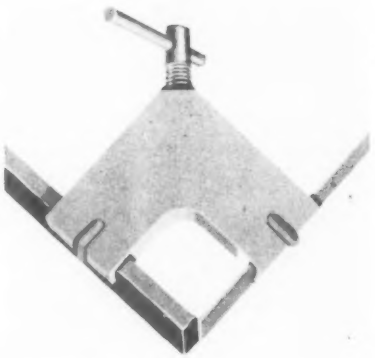


ARMATURE coil ends may be brazed or silver soldered in new brazing machine

Brazing Machine

SILVER soldering and brazing of electric generator and armature coil ends may now be done on a resistance brazing machine that is said to eliminate guesswork and makeshift set-ups.

Armatures from 18 to 42 in. diameter can be handled on the standard CBG-24 brazing machine, and larger sizes can be accommodated with factory changes. A built-in 24-kva transformer with auto-regulating coil and eight-point heat control selector provide a wide range of brazing heats. All common forms of brazing alloys such as foil, wire, strip and powder may be used. AMERICAN ELECTRIC FUSION CORP., 2620 West Diversey Drive, Chicago 47.



VARYING thicknesses of metal easily held for 90-deg. welded corners with new clamp

Corner Clamp

NEW time-saving accessory for the weldor called a "Korner-Klamp" automatically secures two pieces of metal to be welded together at right angles. The pieces to be joined are merely inserted in slots and the screw is tightened to bring them in proper relation, regardless of whether they are of the same or different thickness. Maximum thickness that can be clamped is ⅝ in.

These clamps are expected to prove useful in construction and repair of farm equipment, carrier frames, etc. THERMACOTE MFG. CO., 420 South San Pedro St., Los Angeles 13.

* * *

R-F RADIATION reduced with new arc stabilizer. Inert-arc controls included

Arc Stabilizer

Claimed to markedly reduce r-f radiation, the improved "Missing Link" automatic arc stabilizer may be used with metal-arc, gas-shielded-arc, carbon-arc and spot-arc processes. The new control also automatically cuts off operation when the welding arc is broken. A finger-tip switch, mounted on the electrode holder, is flicked on to resume operation.

For gas-shielded arc welding, the improved stabilizer has built-in inert gas and water valves and automatic control of gas afterflow to protect tungsten electrodes while cooling. MID-STATES EQUIPMENT CORP., 2429 South Michigan Ave., Chicago 16.

BAFFLE PLATE on goggles prevents fogging, yet blocks flying particles, sparks and dust

Headrest Goggles

DISTRIBUTING the weight over the entire head, Jackson's "headrest" goggle No. W-50 is said to offer increased wearing comfort. Eye cups are of molded plastic and the 50-mm lenses fit government specifications. They are available in shades 3 through 6. Each lens is in an individual eye cup and is protected by a cover glass.

The goggle assembly is hinged from the sides of the headrest by telescopic arms attached to concealed springs. Outside of each eye cup has a ventilating screen and a baffle plate to prevent fogging. GENERAL SCIENTIFIC EQUIPMENT CO., 2700 West Huntingdon St., Philadelphia 32.

• • •

REPEATED "prefab" bends in copper, aluminum, brass performed by "Form-Bar"

Bending Machine

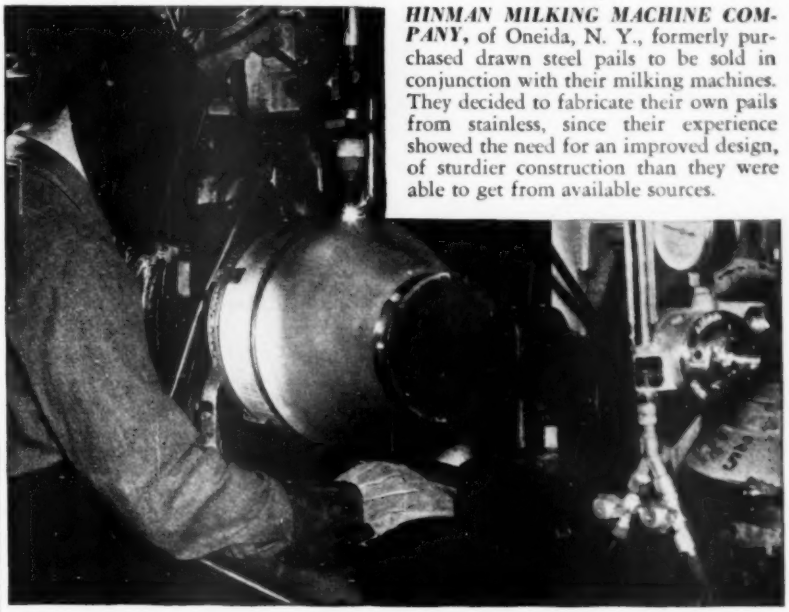
COLD bends may be made in copper, aluminum, brass, mild-steel bar and strips from ⅛ to 1 in. through ½ in. by 6 in. with the "Form-Bar" bending machine. Any type of bend, up, down, sideways, short offsets and Z-bends may be handled, and the bending head can be mounted in a vertical position to handle long lengths of stock. A set-up for repeated "prefab" bending is included. WINFIELD R. SCOTT & SON, INC., 234 South Eleventh St., Newark 7, N. J.

• • •

Goggle Cleaner

A NEW cleaner called "i.R.X. Lenstick" is applied in stick form to goggles and welding lenses. It not only cleans lenses but is said to render them mistproof for periods up to two days. The stick comes in a enameled metal container fitted with a separate cover and equipped with a mechanical feeding device. MIST-PROOF PRODUCTS CO., 165 West End Ave., Brooklyn 29, N. Y.

Machine Heliwelding turns out a better milk pail at lower cost



HINMAN MILKING MACHINE COMPANY, of Oneida, N. Y., formerly purchased drawn steel pails to be sold in conjunction with their milking machines. They decided to fabricate their own pails from stainless, since their experience showed the need for an improved design, of sturdier construction than they were able to get from available sources.

John View, Airco Technical Sales Representative, was consulted and he suggested the Heliwelding process with the Airco machine holder, using Airco Helium. After Heliwelding, only a small amount of polishing was necessary to finish the job, making the cans ready for shipment.

This method was so successful that the customer was able to produce a top quality pail with a tidy saving in money — and time.

• • • •

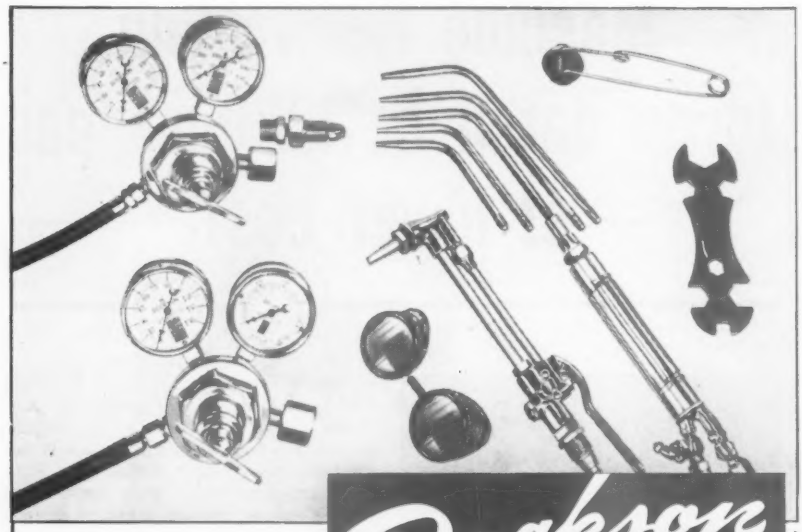
TECHNICAL SALES SERVICE — ANOTHER AIRCO PLUS-VALUE FOR CUSTOMERS

To assure its customers of high efficiency in all applications of the oxyacetylene flame or electric arc, Air Reduction makes available the broad, practical experience of its nationwide Technical Sales Division personnel. The collective experience and knowledge of these specialists has helped thousands to a more effective use of Airco processes and products. Ask about this Airco "Plus-Value" service today. Write your nearest Airco office. In Texas: Magnolia Airco Gas Products Company . . . On West Coast: Air Reduction Pacific Company.

AIRCO **AIR REDUCTION**

Offices in All Principal Cities

Headquarters for Oxygen, Acetylene and other Gases . . . Carbide . . . Gas Welding and Cutting Machines, Apparatus and Supplies . . . Arc Welders, Electrodes and Accessories



Dockson's No. 145 welding outfit shown above.

Dockson WELDING & SAFETY EQUIPMENT

Specialists in "Better-Built" welding and safety equipment, designed through our years of experience for . . . BETTER PERFORMANCE . . . LONGER SERVICE . . . MODERATE COST.

There is a DOCKSON distributor near you. Name on request.

Write for complete Welding and Safety catalogs.

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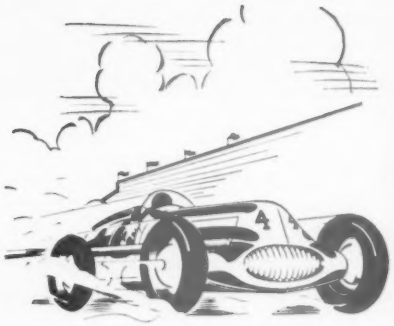
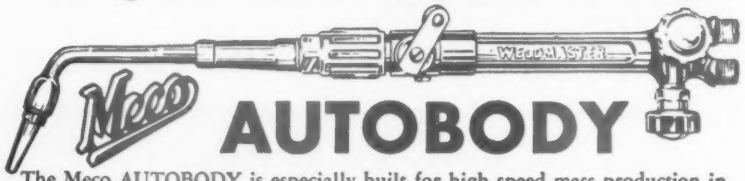


Speed and the ability to take it! are built into the



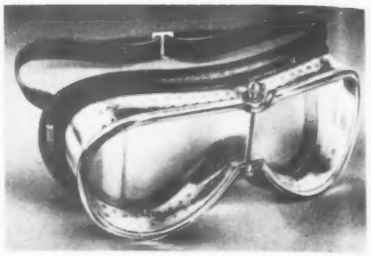
Meco AUTOBODY

The Meco AUTOBODY is especially built for high speed mass production in the automotive and allied fields. Special features enable it to withstand the hard usage common to these industries. The welding head is machined of rugged rod stock and the sturdy tips are interchangeable. It embodies the famous Meco "On-Off" action, tested over 200,000 times without appreciable sign of wear. Other members of the AUTOMAT family are the MIDGE-O-MAT with light weight tip and needle flame for production work on all types of small articles, and the STANDARD for medium to heavy work.

Meco **Send for New MECO Catalog No. 130 today!**

Modern Engineering CO., Inc.

3411-A WEST PINE BLVD. ST. LOUIS 3, MO.



SPONGE-rubber cushions give comfort and added protection with "Panoram" goggle

Goggle Cushions

THE American Optical "Panoram" goggle may now be purchased with sponge rubber cushions molded to the shape of the eyecups. Slipped into place without stapling, sewing or cementing, the cushions are said to offer extra protection against dust and flying particles. They are made of soft, pliable Neoprene sponge rubber.

A new pouch-type plastic case protects the goggles from scratches and dirt while not in use. The case is heavily stitched, has reinforced edges and a flap with a snap hook. Though large enough to enclose the entire goggle, it may be carried in a pocket. AMERICAN OPTICAL CO., Southbridge, Mass.

* * *

400 WELDS per minute possible with new class of Square D resistance welder controls

Spot Welder Control

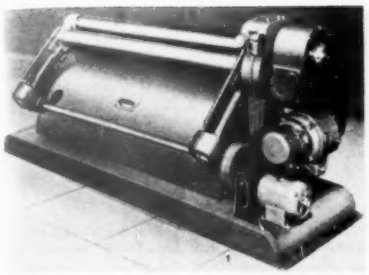
Speeds of over 400 welds per minute and hold-time settings as low as one cycle are possible with the new Class 8992 Square D resistance welder controls. They include NEMA type 3B timers and ignitron tube contactors.

The simple six tube circuit cancels out operating delays of valve and firing relays. Regulated d-c timing circuits insure accuracy for line voltage variations of ± 10%. Firing relay operation is co-ordinated with a-c line supply to give a consistent starting point for each weld. Timer can be connected for either common or separate control supply of 115, 220 or 460 volts, 50 or 60 cycles. SQUARE D CO., 4041 North Richards St., Milwaukee 12.

* * *

Non-Corrosive Flux

A rosin flux to be non-corrosive is now available under the name "Ersin Flux." The flux is said to reduce the surface tension of molten solder, causing it to wet metals rapidly. Nothing but pure rosin is left on the work after soldering, the makers claim. BRITISH INDUSTRIES CORP., 315 Broadway, New York, N. Y.



STAINLESS steel and mild steel up to 96 in. long can be formed in new bending roll

Bending Roll

New Series 600 bending rolls have three 6-in. diameter forged steel rolls driven through an enclosed worm-gear drive. This roll is built with an automatic drop end which raises the top roll when the drop end is lowered for removal of fully rolled circles.

Capacity in mild steel ranges from 48 in. long, 5/16 in. thick to 96 in. long, 10 gauge. REED ENGINEERING CO., 1003-17 West Fairview Ave., Carthage, Mo.

RADIUS BRAKE has capacity of 24-in. 16-gauge steel. Forms non-ductile metals

Bending Brake

O'NEIL-IRWIN has developed a radius-forming brake of 24-in. capacity in 16-gauge sheet steel. This machine was primarily designed for the forming of duraluminum, chrome-molybdenum steel and other materials of low ductility which would fracture if formed to a sharp "no radius" bend. The radii obtained are in accordance with the standards recommended by the U. S. Army Air Corp. O'NEIL-IRWIN MFG. CO., Lake City, Minn.

* * *

Slitting Shear

PORTABLE slitting shear has a capacity of 1/8 in. mild steel and 10-gauge in stainless. Upper blade holder is operated by toggle action. The blades are interchangeable and adjustable; they are furnished in either tool steel or in high-carbon, high-chrome steel. BEVERLY SHEAR MFG. CO., 3009 West 110 St., Chicago.

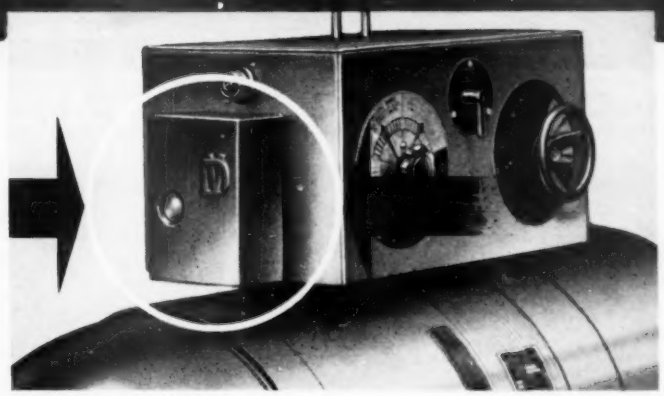
* * *

Stainless Steel Flux

SOLDERING of stainless steel is said to be greatly facilitated by the use of "Stainless Steel 48," a new liquid flux. The fluid is claimed to cut through the grease film present on most stainless to form a strong clean joint. REMONT MFG. CO., Lombard, Ill.

CUT WELDING POWER BILLS BY 40% WITH DV

START-STOP CONTROLS FOR ELECTRIC DRIVEN DC-WELDERS



• No need to pay for unproductive power when DV Welding Controls are used with DC Welders.

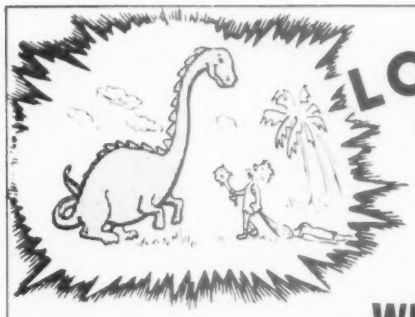
• Under normal conditions without controls, welders run idle 50% to 90% of the working day.

• DV automatic start-stop controls start the welder when arc is struck, stop it 2 minutes after arc is broken.

• Power savings averaging 43%, with substantial reductions in KW rate charges, result when welders are equipped with DV Controls. Savings made will more than pay for the control in the *first* year of use.

Write for new, descriptive bulletin.

DV WELDING CONTROLS
OAKLAND 11, CALIFORNIA



LONGER LIFE

. . . for EQUIPMENT
SUBJECT TO SEVERE ABRASION
with . . .

SEACO Trade Mark

Hard Surfacing WELDING ELECTRODES

Super-Hard Seaco greatly increases the life of Manganal and Carbon steel parts subject to heavy impact and abrasion. Parts repaired with MANGANAL (11-13½% Manganese-Nickel Steel), and protected with SEACO, outlast new ones. An overlay of SEACO allows Manganese steel to workharden before the wear hits it!

Will not soften in application by dilution from parent metal. Seaco electrodes are 95% metal and alloys and only 5% coating — you buy more metal, less coating. Brinell hardness 550-600. 3/16" and ¼" diameters. 12" lengths.

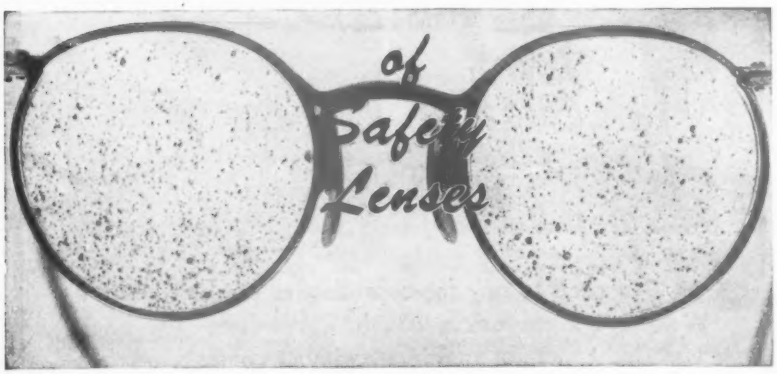
FREE: The "Manganal Marketer" offers Helpful Hints on Hard Surfacing. Write for your copy today!

Dragline bucket lip hard-surfaced with SEACO Electrodes.

STULZ-SICKLES CO.
SOLE PRODUCERS
91 N. J. Railroad Ave. Newark 5, N. J.

NAME OF NEAREST DISTRIBUTOR ON REQUEST

STOP THIS WASTE!



USE **TUF-COTE**

STOPS
Welding spatter and grinding wheel pitting

*Optically Perfect
*Crystal Clear

*One TUF-COTE lens will replace seven to fifteen uncoated lenses.

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OPTICAL COMPANY, INC.
12334 East Jefferson Avenue DETROIT, MICHIGAN

SPECKS OF DUST can be quickly located and removed with a new magnetic instrument

Eye Kit

FIRST aid for the eyes is provided by a compact kit that contains 15 items, including a patented instrument for removing particles. There are also eye drops, eye patch, eye dropper, eye cups, castor oil, boric acid solution, boric-acid ointment, cotton balls and swabs, eye pads, and adhesive strips. All items are plainly visible in the plastic kit box, which measures 8½ by 4¼ by 1¼ in.

The particle remover consists of a nonbreakable plastic magnifier and a magnetized wire loop. After the irritant has been spotted under the magnifying glass, it is mechanically removed with the magnetic loop. OHIO FIRST AID & PHARMACAL CO., 1285 West Sixth St., Cleveland.

* * *

UPSET on flash-welded stock up to 4 in. wide can be trimmed by new machine

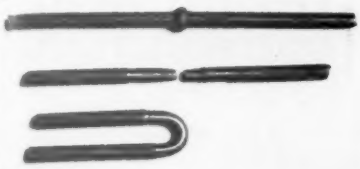
Flash Trimmer

BUILT to remove the upset from butt-welded bars or cylinders, the new Morton flash trimmer can handle stock up to 4 in. wide and 3/32 in. thick. The upper housing is provided with machined surfaces to guide the movable cylinder and upper ram shoe. Holes are bored in the forged steel rams to accommodate tool holders and cutting tools. For placing and removing work, 1½ in. vertical movement is available. Trimmer is automatic with foot pedal starter. MORTON MFG. CO., Broadway and Hoyt, Muskegon Heights, Mich.

* * *

Impact Wrench

ELECTRIC impact wrench drives nuts, bolts, cap screws up to ⅜-in. thread size and studs up to ½-in. thread size. It may also be used for removing broken studs (using special extractor), step drilling or reaming holes and as a drive for a hole saw, rotary file, burring tools, sander or polisher. Weight is 6 lb 14 oz. INDEPENDENT PNEUMATIC TOOL CO., 175 State St., Aurora, Ill.



HARD ROLLED COPPER rod flash welded with Thomson welder. Section is 0.346 in. in diameter. Tensile strength 31,00 psi

Flash Welder

A NEW line of flash welders has been developed for welding mild or alloy steel, bronze, brass, aluminum and magnesium alloys. Flash welds in copper to copper and aluminum to copper are also claimed possible. Flashing takes place during a relatively slow but accelerated motion, at the end of which the upset takes place. For aluminum, figures are: 5/16 in. flash-off, 3/16 in. upset, total consumption ½ in. for both pieces on a 0.46 in. square section of aluminum window frame. THOMSON ELECTRIC WELDER CO., 261 Pleasant St., Lynn, Mass.

* * *

LONGER range claimed in dry-chemical extinguisher. For use in electrical fires

Dry Fire Extinguisher

NEW dry-chemical fire extinguisher is useful for flammable liquid and electrical fires. It is claimed to have longer range, longer duration of discharge and more complete discharge of contents than previous models.

The No. 30 extinguisher has the Underwriters' Laboratories label and is rated B-1 and C-1. Dry chemical is said to be non-toxic, non-corrosive, non-conductive and non-freezing. AMERICAN-LAFRANCE-FOAMITE CORP., Elmira, N. Y.

* * *

Heat-Treat Paste

A CHEMICAL paste known as "Isopac" keeps part of a workpiece soft while the rest is hardened by carburization. It is claimed to prevent the penetration of carbon and to insulate the protected section agianst rapid cooling.

The new method is expected to replace copper plating and other similar ways of isolating sections of the workpiece to be kept soft. DENFIS CHEMICAL LABORATORIES, INC., 172 Pacific St., Brooklyn 2, N. Y.

CRUSHER TOGGLE QUICKLY REPAIRED WITHOUT DISMANTLING USING BRIDGEPORT'S NO. 192 LOW FUMING BRONZE ROD

This crusher toggle must withstand the strain of thousands of shocks an hour as the crusher breaks up skimmings, spills and furnace brick from the casting shop of a brass mill.

When the toggle broke, it was not necessary to dismantle the crusher or build an elaborate set-up for general pre-heating in order to braze-weld. Local pre-heating of the prepared section saved much time and expense, and the job was completed quickly *on the spot*. The braze-welded crusher has been pounding away steadily for the past eight months and appears to be as good as ever.

Are you taking advantage of this quick, inexpensive method of putting equipment back to work with a minimum of lost time? For valuable information about braze-welding and many available alloys, write for your copy of Bridgeport's 24-page booklet, "Bronze Welding Alloys".

"Bridgeport" BRIDGEPORT BRASS COMPANY
BRIDGEPORT 2, CONN. • Established 1865

Mills at Bridgeport, Conn., and Indianapolis, Ind.
In Canada: Noranda Copper and Brass Limited, Montreal

BRONZE WELDING

THE MODERN TOOL OF INDUSTRY

Bronze Welding is widely used: (1) for repairing large and small iron, cast iron, and steel equipment and for building up worn surfaces; (2) for fabricating steel furniture and cabinets; agricultural and industrial equipment; for joining large pipes and duct work; for making silicon bronze tanks, water heaters, and water purifing and waste liquid reclaiming equipment.

Bridgeport Improved No. 192 Low Fuming Manganese Bronze

For gas welding. Melts at approximately 1621° F. Degasified and deoxidized. Produces sound, high strength, tough deposits for repairing heavy duty steel and cast iron machinery and equipment. Equally good for repairing small parts and building up worn surfaces.

Meets Specifications:
Navy 46-R-1 (INT) Grade 1, Class A.
Watertown Arsenal WXS-175, Type A.

Bridgeport No. 241 Naval Brass

For gas welding. Melts at approximately 1630° F. Excellent for uniting cast iron and steel parts in general repairing, welding automobile engine blocks, locomotive cylinders, cast iron pipes, etc.

Meets Specifications:
Navy 46-R-1B, Type B; 46-R-1 (INT), Grade 1, Class A.
Federal QQ-R-571, Type B.
Watertown Arsenal WXS-175, Type B

Bridgeport No. 191 Manganese Bronze (Navy)

For gas welding. Melts at approximately 1630° F. Fine for all around uses such as general repairing of cast iron and steel castings, broken gear teeth, pistons, shafts, building up worn surfaces, etc.

Meets Specifications:
Navy 46-R-1 (INT), Grade 1, Class A; 46-R-1B, Type A.
Federal QQ-R-571, Type A.
Watertown Arsenal WXS-175, Type A.

Bridgeport No. 632 Silicon Bronze (3% Silicon)

For gas, carbon arc, and metallic arc welding. Melts at approximately 1882° F. Produces dense deposits of high physical properties. For welding silicon bronze, copper, aluminum bronze of low aluminum content, brass and malleable iron. Exceptionally good for carbon arc operations on light gauge steel and galvanized iron.

Meets Specifications:
Navy 46-R-1 (INT), Grade II, Class A.
Watertown Arsenal WXS-175, Type G

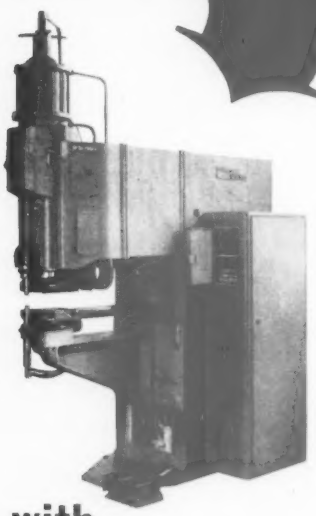
Bridgeport No. 609 Silicon Bronze (2% Silicon)

For gas, carbon arc, and metallic arc welding. Melts at approximately 1918° F. Very similar in properties and applications to Bridgeport No. 632.

Meets Specifications:
Navy 46-R-1 (INT), Grade II, Class A.

Bronze Welding Rod A PRODUCT OF
BRIDGEPORT BRASS

Low Power
BALANCED
3
PHASE



with . . .

Tri-Phase
TRADEMARK
RESISTANCE
WELDERS

• WELDS FASTER and BETTER

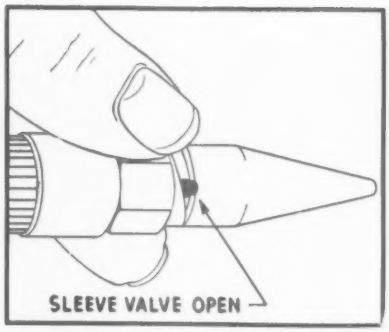
STEEL	STAINLESS
ALUMINUM	MAGNESIUM
MONEL	INCONEL

BRASS ALLOYS

• Write for T-W Tri-Phase Bulletin and check for yourself on the high production value of TRI-PHASE.

THE TAYLOR-WINFIELD CORPORATION
WARREN, OHIO, U. S. A.

TAYLOR-WINFIELD
RESISTANCE WELDERS



CONTROLLABLE volume of cooling air mixed into oxyacetylene flame on medium-temperature welding tip with sleeve valve

New Welding Tip

MEDIUM-TEMPERATURE welding tip that fits over standard oxyacetylene tips is designed for white metal welding, aluminum brazing, silver brazing, etc.

A side orifice and sleeve valve introduce a controllable volume of air into the oxyacetylene mixture which cools the flame. The flame is lit and adjusted the same otherwise as standard tips. In shutting off the gas flow, the oxygen should be turned off first, however.

For attachment to blunt nose tips, the end ferrule must be removed. L. B. WHITE Co., 422 North 10th St., La Crosse, Wis.

* * *

Brazing Fluxes

FOUR new fluxes developed by Victor are claimed to fulfill major requirements of a good flux; namely to clean both parent and filler metal, to leave the finished braze clean, to tin burned spots in cast iron, to cling to the heated rod and not blow off it.

Brass, bronze, steel, clean cast-iron and malleable-iron may be brazed with Victor No. 3 flux. No. 5 flux is recommended for moderate-heat brazing of cast and malleable iron, and No. 7 flux is claimed useful for high-heat brazing of cast and malleable iron. No. 9 flux is for fast welding of cast iron, and it will not cake when the container is subjected to moderate high heat. VICTOR EQUIPMENT Co., 844-54 Folsom St., San Francisco 7.

* * *

Hard-Facing Alloys

NEWLY announced Airco hard-facing alloys are divided into three primary groups: ferrous, cobalt base and tungsten carbide. A total of 15 different alloys is included in this line.

To stimulate introduction, manufacturer is offering a special trial assortment package which includes "Aircolite" alloy for equipment subjected to severe abrasion and medium impact such as pulverizer hammers and core crusher rolls and "Airco Self-Hardening" alloy to withstand severe impact and abrasion such as bucket teeth and sizing screens receive. The trial assortment package is available at $2.95 and includes instruction sheets and a comprehensive booklet covering the entire hard-facing line. AIR REDUCTION SALES Co., 60 East 42nd St., New York City 17.

Tempilstiks°

the amazing Crayons that tell temperatures

A simple method of controlling temperatures in:

- WELDING
- FLAME-CUTTING
- TEMPERING
- FORGING
- CASTING
- MOLDING
- DRAWING
- STRAIGHTENING
- HEAT-TREATING IN GENERAL

Also available in pellet and liquid form

It's this simple: Select the Tempilstik° for the working temperature you want. Mark your workpiece with it. When the Tempilstik° mark melts, the specified temperature has been reached.

$2 each

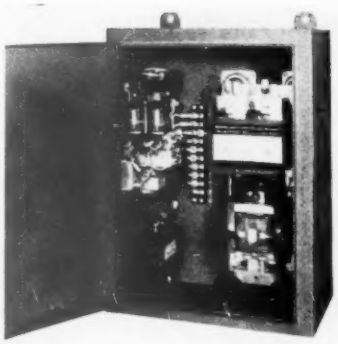
gives up to 2000 readings

Available in these temperatures (°F)			
125	275	500	1100
138	288	550	1150
150	300	600	1200
163	313	650	1250
175	325	700	1300
188	338	750	1350
200	350	800	1400
213	363	850	1450
225	375	900	1500
238	388	950	1550
250	400	1000	1600
263	450	1050	

FREE —Tempil° "Basic Guide to Ferrous Metallurgy" — 16¼" by 21" plastic-laminated wall chart in color. Send for sample pellets, stating temperature of interest to you.

Tempil° corp.
132 WEST 22nd STREET
New York 11, N. Y.

We invite inquiries from reputable distributors interested in handling **Tempil°** *Products.*



DWARF CONTROL combination for small resistance welders has NEMA 1A timer

Small Weld Timer

FOR small resistance welders is offered a "dwarf control" combination, Weltronic Model 106-53BA1. It consists of a NEMA 1A timer with a high-speed magnetic contactor mounted in a compact cabinet measuring 17 in. high by 14⅜ in. wide by 8 in. deep. The single-stage weld timer may be adjusted from 3 to 120 cycles. WELTRONIC CO., 19516 West Eight Mile Rd., Detroit 19, Mich.

* * *

BETTER BALANCING is claimed to be a feature of new Adams cylinder trucks

Cylinder Truck

CYLINDER trucks capable of carrying gas cylinders in either tandem or side-by-side arrangement are now being manufactured in an improved design. These trucks may be ordered with close-fitting welded wide-spoke steel wheels or with barr-bearing, rubber-tired wheels. ADAMS MFG. AND SUPPLY CO., 1522 North Indiana St., Los Angeles 33.

* * *

A-C Welder

DESIGNED for general welding and maintenance in industrial plants, garages, farms, etc., the Model 170 Birdsell welder features stepless control between 15 and 170 amp with a single control bar. It may be used on either 110 or 220 volts. Unload voltage is 53 volts. Two or more of these welders may be coupled for heavy-duty welding. BIRDSELL MFG. CO., INC., 500 San Antonio Rd., Los Altos, Calif.

10, 40 and 60 Cu. Ft.
ACETYLENE
CYLINDERS
NOW AVAILABLE
for Early Delivery
60 cu. ft.
40 cu. ft.
10 cu. ft.
New Low Prices
Faster Pumping
Lighter Weights
These are plus features of the new C G Cylinders with the C G C improved porous monolithic filler. Completely tested and approved by the U. S. Bureau of Explosives . . . these new Acetylene Cylinders conform in every detail to ICC specification EIGHT!
All large sizes...100, 150, 250 and 300 minimum Cu. Ft. capacities... are also available, and hold maximum gas capacities at normal pumping pressures.
New, EASIER TO GRIP OCTAGON CAP
The exclusive CGC Octagon Cap is now available for separate order. 50% thicker dome, 25% lighter weight, smooth finish and extra large shipping tag holes are popular features.
CGC
COMPRESSED GAS CYLINDERS, Inc.
P. O. Box 222, Vernon Branch • 2909 East 54th Street, Los Angeles 11

News of the Industry

Linde Licenses Processes For Powder Cutting, Scarfing

The Linde Air Products Co., New York City, has licensed its powder-scarfing and powder-cutting processes to commercial oxygen producers, manufacturers of oxy-acetylene equipment and others who have a legitimate interest in extending the benefits of these processes to industry.

Licenses are granted under the process claims of Linde's patent rights upon reasonable and uniform terms and include the right to sub-license.

* * *

Progressive Welder Opens R-W Maintenance School

PROPER maintenance of resistance-welding equipment is the purpose of a new school recently opened by Progressive Welder Co., Detroit. Twelve men on Progressive's design, construction, engineering and application staffs are instructors, and laboratory and classroom facilities worth $200,000 have been installed. In August a "Design for Resistance Welding" course will be started.

John D. Gordon, vice-president and general manager of the company, states that since the real growth of the resistance welding industry lies ahead, a school for proper maintenance and efficient design is a necessity.

Length of the maintenance course is 5 days, Monday morning to Friday afternoon. Classes will be limited to not more than 12 students. No charge is made for the training but students must pay their own hotel and meal costs. Arrangements have been made with the Fort Shelby Hotel, Detroit, to accommodate students living outside the city.

A two-color, 20-page booklet describing the school and its facilities may be obtained from the personnel dept., Progressive Welder Co., 3050 East Outer Drive, Detroit 34.

* * *

RWMA Elects New Officers At Annual Meeting

B. L. WISE, director of production, National Electric Welding Machines Co., Bay City, Mich., has been elected president of the Resistance Welder Manufacturers' Association at the annual meeting in Detroit. Mr. Wise succeeds T. S. Long, vice-president and general manager, Taylor-Winfield Corp., Warren, O., who was elected chairman of the executive committee.

Named vice-president of the group, which comprises manufacturers of resistance welding equipment was T. Embury Jones, president, Precision Welder and Machine Co., Cincinnati, O.

The "alloy" group in the association, comprising manufacturers of resistance-welding electrodes, elected as its chairman, W. G. Fetter, manager, resistance-welding division, P. R. Mallory & Co., Inc., Indianapolis, Ind.

George A. Fernley and H. R. Rinehart were re-elected executive secretary and secretary-treasurer, respectively. Fernley and Rinehart make their headquarters at the association's main offices at 505 Arch St., Philadelphia.

* * *

R-W Manufacturing, Designing Firm Starts at Warren, O.

CARLSO'N, INC., Warren, O., has been formed for the design, engineering and manufacture of special production machinery, particularly resistance welding equipment.

Officers are: A. L. Carlson, president; L. R. O'Neill, vice president; Henry A. Stix, secretary and treasurer. All were formerly associated with The Federal Machine and Welder Co., Warren.

* * *

LIGHTING the 75th birthday cake for A. O. Smith Corp., Milwaukee, is Herman Welzien, in his 58th year of service with the company. J. J. Stamm, treasurer, with the company 51 years, watches him do the honors

A. O. Smith Celebrates 75th Anniversary

RECENT festivities in Milwaukee commemorated the 75th anniversary of the A. O. Smith Corp. Founded as a general machine shop in a semibasement in downtown Milwaukee in 1874 by C. J. Smith and his sons, the firm first specialized in baby buggy and bicycle frames.

Before World War I the firm became a leading supplier of pressed steel auto frames. Coupled with the experience in this field was an understanding of welding obtained from War I contracts, which enabled the company to expand and grow in the manufacture of welding electrodes, pressure vessels, large-diameter gas line pipe and oil well casing, water heaters, pumps, glass-lined tanks and many other products.

* * *

Acetylene Association To Meet in Pittsburgh

THE 1949 convention of the International Acetylene Association will be held at the William Penn Hotel, Pittsburgh, April 25 and 26. Information may be secured by writing to T. C. Fetherston, chairman of the committee on program and publicity, at IAA headquarters, 30 East 42nd St., New York City 17.

WELL EQUIPPED school laboratory includes flash welders, portable gun installation, projection welder, press-type spot welder and seam welders. Controls are synchronous and non-synchronous with postheat

CLASSROOM facilities shown are welder controls, standard guns and parts, hydraulic and air cylinders, valve and booster assemblies. Films, slides, charts, library, etc., are also available. Chairs are desk type

Milwaukee Industrialist Tells of European Trip

CONDITIONS in European countries are generally improved over those existing 16 months ago. Walter Harnischfeger, of Harnischfeger Corp., Milwaukee, stated recently after returning from a business trip through Holland, Belgium, France, Switzerland and Germany.

He believes that much of the improvement lies in American dollar aid, however, rather than in true self-recovery. An immediate stop to plant dismantling should be made, Mr. Harnischfeger said, permitting Central Europe to produce the essentials for its recovery and enable it to develop on a peacetime basis.

Mr. Harnischfeger cited the case in the American Zone where many chemical plants have been dismantled. Since they produced fertilizer, an economic necessity in European agriculture, such fertilizer must now be imported with Marshall Plan dollars.

* * *

Lindberg Engineering Opens Office at L. A.

LINDBERG Engineering Co., Chicago, has established a new west coast office at 5331 South Vermont St., Los Angeles. Stuart K. Oliver, formerly in charge of the Cleveland office, is the new L. A. manager.

* * *

1949 Metal Show Scheduled For Cleveland Oct. 17-21

THE 31st annual Metal Congress and Exposition will be held in Cleveland on October 17-21, announces W. H. Eisenman, national secretary of the American Society for Metals.

The show will require both floors of the city's Public Auditorium, as well as its underground floor facilities, some 250,000 sq. ft. in all. Space assignments for industrial exhibitors will be made on March 12.

* * *

Tube Turns Appoints Oklahoma Distributor

ARDUN Co., Tulsa, Okla., has been appointed a distributor of Tube-Turn welding fittings and flanges. The firm has its offices and warehouse at 317 South Detroit Ave., and is a partnership formed by two well known Tulsans: H. W. (Doc) Arduser and Robert H. Duenner, Jr.

* * *

Welding Fittings Corp. Expands by Purchase

WELDING FITTINGS CORP., New Castle, Pa., has purchased the business formerly conducted by the Stainless Alloy Division of Pittsburgh Piping and Equivalent Co. The latter concern will continue to manufacture and fabricate power piping.

* * *

All-State Alloys Moves to New Building

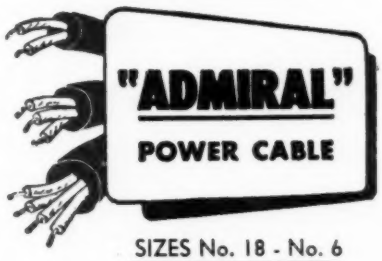
ALL-STATE WELDING ALLOYS Co., Inc., has moved into its new headquarters building at 273 Ferris Ave., White Plains, N. Y.

CONCENTRATE!!!...

America's 1st Choice

SIZES No. 6 - No. 4/0

A Fast Seller



SIZES No. 18 - No. 6

Many Millions of Feet have been sold

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PROMPT SHIPMENTS!! ALL OVER THE UNITED STATES

YOUR LOCAL WELDING SUPPLY DEALER IS QUALIFIED TO QUOTE LOWEST PRICES • • *DELIVERIES FROM STOCK* • •

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WELDING ENGINEERING CORPORATION

MANUFACTURERS • DISTRIBUTORS

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Sales Offices

2737 S. 34TH ST. MILWAUKEE 7, WIS.

New!

5 KVA Spot Welder and 120-Ampere Arc Welder in *One* Combination Unit

both for considerably less than the cost of separate units!

DELTA® "DUAL-WELD" COMBINATION WELDER

Spot weld, arc weld, braze, and solder — you can do all this, with this new Delta Combination Welder. You can work on fine wire, without burning or overheating—and spot weld up to 16-gauge steel on a production basis.

The price for this dual-purpose unit is considerably under that of any individual 5 KVA spot welder or 120-ampere arc welder! That's due to Delta's unique design, careful engineering, and high-production methods.

Delta is a name you can count on for high quality. True, it's a new name in welding. But in many other industries, low-cost Delta Machine Tools have long been recognized as the finest machines available.

Have your nearby Delta distributor show you the new Delta Combination Welder. Get a better idea of the many ways that you can use it profitably. Also see the new **Delta 5 KVA Spot Welder** and **Delta Portable Arc Welder.** And ask about buying on easy, convenient time payments.

Send for descriptive Bulletin AD-453.

DELTA MILWAUKEE

No Other Welder Like It!

Look at these features:

- One-piece Welding Horns
- Simple Contactor
- Wound Transformer Core
- Calibrated Current Scale
- 10" Throat Depth
- Double-Insulated Coil
- Full Spot Weld Pressure Adjustment

*Price subject to change without notice

DELTA MANUFACTURING DIVISION
ROCKWELL MANUFACTURING COMPANY
MILWAUKEE 1, WISCONSIN

Fuse-Weld Cast Welding Rods

THE STANDARD OF QUALITY THROUGHOUT THE WORLD

CAST ALUMINUM
WELDING RODS
OF STANDARD ANALYSIS
PLAIN AND ALLOYED GRAY IRON
WELDING RODS
- ELECTRODES -

THE CHICAGO HARDWARE FOUNDRY COMPANY
349 ENGINEERING BUILDING
NORTH CHICAGO • • ILLINOIS

Acme Steel Company Installs 5-Stand Cold-Rolling Mill

An investment per man of $62,500 is represented by the 40 men operating the new 5-stand, 4-high cold rolling mill recently installed by Acme Steel Co., Chicago. Cost of the building, rolling mill, operating motors and control equipment is $2,500,000.

Each stand is powered by 1,250-hp motors and controlled by equipment made by General Electric Co. and Westinghouse Electric Corp. Air cooling the motors is cleaned by a "precipitron" and forced into the motor room under high pressure so that no other outside air can enter.

Below the mill is the oil basement, a maze of tanks and welded piping for storing and carrying the thousands of gallons of oil needed for lubrication, cooling and hydraulic pressure devices.

Top speed of the mill is 3,000 ft per minute. Widths of the strip rolled can be from 8 to 18¼ in., with finished thicknesses ranging from 0.006 to 0.020 in.

* * *

Norwegian Firms Build Welded Electric Locomotives

Arc welding was used extensively in the production of express electric locomotives by Thunes Mek. Vaerksted A/S and A/S Norsk Elektrisk og Brown Bouveri, both of Oslo, Norway. Frame, outside paneling and motor housings were all welded constructions.

Norwegian type 1-D-1 locomotives weigh 80 tons and are 41 ft long. They have 2,800 hp supplied by four motors. Another type built weighs 40 tons and has a length of 28 ft 9 in.

—*McGraw-Hill World News*

* * *

Electronic Conference At Chicago in September

Edgewater Beach Hotel, Chicago, will be scene of the 1949 National Electronics Conference, being held on Sept. 26, 27 and 28 under sponsorship of the Illinois Institute of Technology, University of Illinois, Northwestern University, American Institute of Electrical Engineers and the Institute of Radio Engineers.

Committee chairmen for the meeting are: program, Dr. L. T. Devore, professor of electrical engineering, University of Illinois, Urbana, Ill.; publicity, James W. Armsey, director of public relations, Illinois Institute of Technology, Chicago; exhibits, N. Cohn, district manager of technical sales, Leeds Northrup Co., Chicago; and housing, C. M. Brentlinger, division traffic superintendent, Western Union Telegraph Co., Chicago.

* * *

Pardon, Please

On page 90 of the February issue the photograph of the weldor in the "bottoms up" position was reproduced without credit to The Lincoln Electric Co., to whom we are indebted for this amusing picture.

Electronic Controls Meeting At Buffalo on April 11-12

A CONFERENCE on the industrial application of electron tubes, to be held in the Statler Hotel, Buffalo, N. Y., April 11 and 12, is expected to provide an opportunity for tube users to discuss their problems with tube manufacturers and designers of control equipment. The meeting is sponsored by the American Institute of Electrical Engineers.

Program for the first day includes a technical session on the application of electron tubes in control, an inspection trip to the new Westinghouse plant, and a presentation of several papers by users describing their operating experience and tube maintenance problems.

The second day, April 12, will be a discussion of the items which must be considered in designing control tubes and the methods used by manufacturers in building and rating such tubes.

* * *

IAA Proceedings for 1944-47 Bound into Single Volume

A SINGLE 258-page, cloth-bound volume covering the proceedings of the International Acetylene Association for the years 1944, 1945, 1946 and 1947 is now being mailed to each individual, associate and honorary member and to designated representatives of company members. The volume does not include the proceedings of the 1948 convention. It is intended that this meeting and the one to be held in 1949 at Pittsburgh be combined in one printed volume later.

* * *

Study Steel Qualities At High Temperatures

HEAT-AFFECTED weld zones in steel were tested recently for stability at prolonged high temperatures. Results were published in a paper titled "Stability of Steels at Elevated Temperatures" by A. B. Wilder and J. O. Light, chief metallurgists at Pittsburgh and Lorain, O., respectively, for National Tube Co. Paper was presented at American Society for Metals convention last October in Philadelphia.

Strength may be adversely affected by graphitization; i. e., the gradual deposition along grain boundaries of microscopic flakes of graphite. This usually follows heating above 1,000 F. for a long period. Since chromium, columbium, zirconium, and titanium are recognized as inhibitors of graphitization, steels alloyed with these elements were tested. Results showed:

After 10,000 hours exposure at temperatures of 900, 1,050 and 1,200° F., titanium and columbium-moly steels did not graphitize, but graphitization occurred in both parent metal and weld heat-affected zone of molybdenum and zirconium steels. The 12% chromium steels appeared to be the most stable with respect to microstructure, impact properties and hardness at all temperatures.

Carbide precipitation at the grain boundaries was observed in the austenitic 18-8, 18-8 FM and 18-8 Mo steel, in both parent metal and heat-affected zone, under the same test conditions. It first occurred in the weld heat-affected zone.

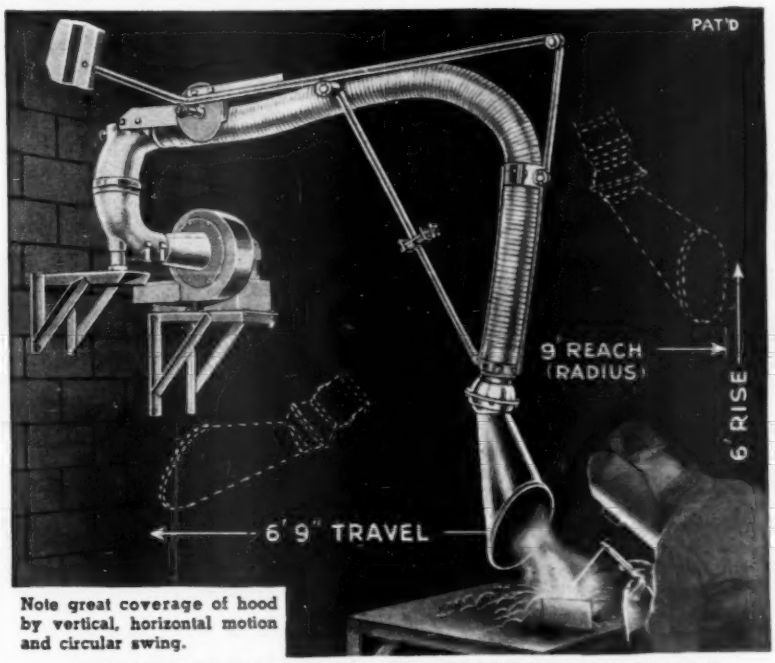
3 Reasons Why We Chose a RUEMELIN FUME COLLECTOR

There are 3 good reasons why we decided to install a RUEMELIN WELDING FUME COLLECTOR in our shop, after we saw it in operation. Like all of our equipment this measures up to the highest standards of dependable performance and maximum health protection because it is:

1. MORE EFFECTIVE — The powerful suction of the RUEMELIN FUME COLLECTOR efficiently draws out noxious gas, smoke and heat at the source. It provides great coverage, minimizes building heat loss, reduces welder's fatigue and guards employee's health — all to increase shop efficiency and output.

2. COMPLETELY FLEXIBLE — It is easily installed with least expense. When in operation, its hood instantly and conveniently adjusts for greater proximity to welding area without tedious adjusting devices.

3. UNIVERSALLY APPROVED — The RUEMELIN FUME COLLECTOR has the approval of state industrial commissions and compensation insurance companies. In addition it has the support of the thousands of users who have found their Ruemelin installations so satisfactory on the job.



Note great coverage of hood by vertical, horizontal motion and circular swing.

Standard Model D-5310 with hood reaching out 9 feet from wall. Also available in Long Reach Model D-5342 with hood reaching out 15 feet from wall.

For complete details write for Bulletin 37-C

RUEMELIN MFG. CO.

MANUFACTURERS AND ENGINEERS
SAND BLAST AND DUST COLLECTING EQUIPMENT
3880 NORTH PALMER STREET • MILWAUKEE 12, WISCONSIN, U. S. A.

A5490-3/8-R

When heavy, unwieldy weldments like these diesel crank cases can be quickly swung into any position so that every weld is made **downhand**—that's efficient welding!

Weldors spend more time welding—do better welding at lower cost when they work with C-F Positioners because these hand and/or power operated machines reduce positioning time to a minimum. Investigate the cost-saving advantages of C-F Positioners. They pay their way in any company.

Write for Bulletin WP24—an illustrated circular detailing the Specific advantages of C-F Positioners.

Cullen-Friestedt Co., 1309 S. Kilbourn Ave.

CULLEN-FRIESTEDT CO., CHICAGO 23, ILL.

C-F positioned welds mean better, more economical welds

for dependable
PERFORMANCE

"FLUXINE" Fluxes are the result of over fifty years of scientific research into the metal-joining field. There are 89 FLUXINE Fluxes . . . one for every welding, silver soldering, brazing, and soft soldering operation . . . each with its own properties, designed for a particular metal-joining operation. All have been perfected not only for highest efficiency, speed, and long life, but for economy and safety as well. FLUXINE Fluxes produce no injurious fumes to irritate eyes or nose of the operator.

Write on your company letterhead for a generous sample stating which FLUXINE Flux you desire.

KREMBS & COMPANY
(Est. 1875)
Dept. G, 669 W. Ohio St., Chicago 10, Ill.

No. 4 FLUXINE, in powder form, for welding cast iron with bronze rods.

No. 7 FLUXINE for welding all types of aluminum.

No. 18C FLUXINE for gas and atomic hydrogen welding of stainless steels and inconel.

No. 41 FLUXINE used with high-melting silver solders on copper and its alloys and on steel.

No. 42 FLUXINE used with Westinghouse Phos-Copper rods and low-melting silver solders on copper and its alloys.

No. 43 FLUXINE . . . non-glaring . . . used when low-melting silver solders are specified. No injurious fumes. Goes further than most fluxes.

FLUXINE
TRADE MARK REGISTERED U. S. PAT. OFF.
FLUXES TO JOIN ALL METALS

Specialists To Speak at Western Metal Show

An impressive educational program will be presented by the American Welding Society at the Western Metal Congress and Exposition, April 11-15 in Shrine Convention Hall, Los Angeles.

Such well-known speakers and authorities on welding as John J. Chyle, Charles A. Babbitt, J. H. Cooper, E. Paul DeGarmo, Alan E. Flanigan, Robert T. Gillette, G. B. Grabe, Frank G. Harkins, Eugene Lica, Earl Parker, T. E. Piper, H. W. Sharp, Kenneth M. Spicer, Myron D. Stepath, and C. B. Voldrich will present papers.

Three panel discussions will be held on three evenings to offer information on a question-and-answer basis.

Welding program chairman is Hugo W. Heimke of the Los Angeles Chapter of AWS.

* * *

Black & Decker Expands Three Branch Offices

Black & Decker Mfg. Co., Towson, Md., has moved its Chicago sales and service station to a new building at 1100 West Jackson Blvd. The Chicago building covers 12,250 sq ft and provides complete servicing and showroom facilities.

A new factory service station, opened at 1094 Gilbert Ave., Cincinnati, O., is the 25th such station to be operated by Black & Decker throughout the country. It is in charge of Robert A. Brown, service engineer.

The company's factory service station at Denver has been moved to a new building at 1010 Bannock St., which has a large showroom and ample shop facilities. Elmer F. Sitton is in charge at Denver.

* * *

Pamphlet on Protective Glasses Available from Government

Information on the light-transmission properties of most of the widely distributed makes of tinted industrial lenses is now available in a new circular, C471, "Spectral-Transmissive Properties and Use of Eye-Protective Glasses," put out by the National Bureau of Standards.

The results tabulated cover some 200 glasses with respect to elimination of glare, color distortion, use of glasses for night driving, industrial uses, and special properties for use with ultraviolet, luminous and infrared radiation.

Pamphlet has 34 pages and 93 illustrations. For copies send 20 cents to Superintendent of Documents, U. S. Government Printing Office, Washington 25, D. C.

* * *

American Optical Company Buys Stamford Property

American Optical Co. recently purchased a 6-acre tract at Stamford, Conn., to build a new research laboratory. The property includes a nearly new building which will be remodeled for research. It contains 13,000 sq ft of floor space to supplement the company's present research facilities at headquarters in Southbridge, Mass., and at the scientific instrument division, Buffalo.

Tenth Ohio Welding Conference Scheduled for April 7 and 8

The tenth annual Ohio Welding Conference will be held April 7 and 8 at Columbus, O., under the sponsorshop of the Department of Welding Engineering, Ohio State University, Columbus.

The Columbus section of the American Welding Society has taken part in preparations for the conference and will hold a dinner meeting on Thursday evening of the meeting.

Oxyacetylene and inert-gas-shielded processes will be discussed Thursday morning, April 7. Metallic arc problems will be featured in the afternoon. Resistance welding papers will be presented Friday morning with power piping and pressure vessel discussions scheduled for the afternoon.

Among well-known speakers on the program will be Martin P. Korn, consulting engineer, Detroit; Adrien F. Busick, Jr., chief engineer, Marion Power Shovel Co., Marion, O.; C. B. Voldrich, chief welding engineer, Battelle Memorial Institute, Columbus, O.

• • •

Gary, Ind., Distributor Moves Into New Quarters

RAPID growth of Calumet Welders Supply, Inc., Gary, Ind., was recently capped by the occupation of a new building at 1122 Virginia St., in Gary. The company commenced operations on Jan. 1, 1945, in space rented in a local garage.

By the end of 1945, business conditions allowed purchase of an additional truck for oxygen deliveries and the hiring of two more employees. During 1916, two salesmen were added to the business. By the end of 1947, another office worker and another truck were added.

The new building measures 92 by 30 feet and is divided into three sections. The front section is occupied by the office and show room. In the center is storage space for electrodes and other equipment and in the rear is the cylinder storage room. The latter is a fireproof room with sunken pits for trucks to load and unload cylinders at floor level.

An open house was held recently at which more than 150 guests attended. Leading manufacturers of welding equipment demonstrated inert-arc welding, machine cutting and low temperature brazing.

In the opinion of the owners, F. G. Squire, G. E. Squire, and F. J. Hupertz, sufficient interest was shown in the open house activities to plan on holding a similar demonstration and clinic every year.

• • •

United Welding Company Expands Middletown Plant

UNITED Welding Company, Middletown, O., is planning an expansion program which will boost by 300 to 400 tons per month its production tonnage of welded steel parts for Diesel switch engines of the Lima-Hamilton Corp. Two new buildings, constructed at a cost of $83,500, are scheduled to be finished by April 1.

"you can say it over and over again"

NEXT BEST THING TO YOUR EYES IS "eyegard"

In coverspecs or regular models. For chippers and grinders as well as welders.

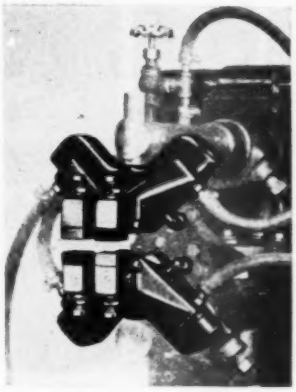
Eyegard "Champions" have 10-way Ventilation

Give your men the finest in comfort and protection—Eyegard "Champions"! They're the goggles that provide greater comfort because the lightweight plastic frame is molded to form-fit the face . . . greater protection because the goggles are impact-resisting . . . greater ventilation through three large vents at side of cup and seven additional vents around the lenses. Cool and fog-free. With all their exclusive features, they cost no more than ordinary goggles. Get Eyegard "Champions" on your next order.

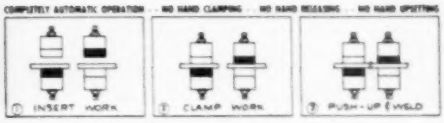
Write for free catalog of Eyegard Equipment . . . it will save you money!

AMERICAN INDUSTRIAL SAFETY EQUIPMENT COMPANY
849 LEXINGTON AVENUE BROOKLYN 21, NEW YORK
DIVISION OF THE BURDETT OXYGEN COMPANY • CLEVELAND, OHIO

. . . . MAKE YOUR SPOT WELDER A BUTT WELDER IN 2 MINUTES SIMPLE • INEXPENSIVE



HOFFMAN BUTT-ON-SPOT AUTOMATIC BUTT WELDING ATTACHMENT


COMPLETELY AUTOMATIC OPERATION . . . NO HAND CLAMPING . . . NO HAND RELEASING . . . NO HAND UPSETTING
1 INSERT WORK
2 CLAMP WORK
3 PUSH-UP & WELD

WELDING EQUIPMENT MANUFACTURERS USERS DISTRIBUTORS
Write today for information on this time-saving, money-saving attachment.

★ The Hoffman Butt-On-Spot Attachment is a water-cooled completely automatic butt welding attachment designed to fit any spot welder having a minimum horn clearance of 7"—manual, air operated, or motor driven.

Maximum capacity dependent on welder KVA capacity but recommended maximum is ⅜" dia. round stock, 5/16" square stock, and ½"x⅜" rectangular stock.

ROBERT W. HOFFMAN CO., INC.
8 S. CLINTON STREET, CHICAGO 6, ILL.

AMAZING PRODUCTION RECORD
CAN *NOW* BE TOLD!

T. M. Reg.
Pat. Nos.
2,174,551
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2,452,995

KWIK FLUX

FASTEST FLOWING . . . CLEANEST WORKING
Hard Soldering and Brazing Flux

Now it can be told how KWIKFLUX time-saving and cost-cutting qualities speeded production of essential war items! Bazookas, Mortar Shells, Tail Fins, Rifle Grenades, M69-M74 Bombs, Aeroplane Intake Manifolds, Aerosol Bombs, Burster Tubes, and scores of other products. KWIKFLUX meets all rigid standards and specifications.

DOUBLE PENETRATION POWER!

The double penetration power of KWIK-FLUX is achieved by our incorporation of phosphates, which is covered by patents. KWIKFLUX is a superior fluxing agent for all types of hard soldering, brazing and welding—speeds production—cuts finishing costs. Works perfectly with direct flame gas, hydrogen, acetylene and muffle (direct and indirect) and induction heating.

SEND FOR FREE TRIAL JAR!

See for yourself the cost-cutting and work-improving qualities of KWIK-FLUX. Send for free sample jar—mention type of work for which it is to be used. *Write today! Ask for Bulletin No. WE.*

SPEC SPECIAL CHEMICALS CORP.
30 IRVING PLACE, NEW YORK 3, N. Y.

CYLINDERS for ALL GASES

10 C.F. 40 C.F. 60 C.F. 100 C.F. 150 C.F. 250 C.F. 300 C.F. 340 C.F.

INDEPENDENT Acetylene cylinders take from 5 to 10% more gas. Uniformity of monolithic filler insures even distribution of acetone. Also Oxygen cylinders in all sizes—storage cylinders, in 12 and 20' lengths of 850 and 1500 cu. ft. capacities.

We invite your inquiries on all your cylinder requirements.

INDEPENDENT ENGINEERING COMPANY, Inc.
CONSULTING · RESEARCH · DESIGNING
Manufacturers of
CYLINDERS AND GAS PRODUCING EQUIPMENT
ACETYLENE · OXYGEN · HYDROGEN · NITROGEN
O'FALLON 5, ILLINOIS

Chicago Technical Conference At Stevens Hotel, March 14-17

"WHAT'S NEW?" will be the theme of the 1949 Chicago Technical Conference and Production Show, scheduled to be held at the Hotel Stevens on March 14, 15, 16 and 17. The Conference is sponsored by the 55 affiliated societies making up the Chicago Technical Societies Council, which include the local chapter of the American Welding Society.

Subjects such as equipment, methods, materials, management, research and plant facilities will be discussed by some 50 speakers. New equipment, services and materials will be on view at the Production Show.

If registration for the Conference is made before March 10, a fee of $1 will be charged. At the conference the registration fee will be $2 for the four days, or $1 per day for single days. No registration fee is required for the Production Show.

* * *

Dravo Builds 444 Barges For Inland Waterways

WELDED steel construction has enabled Dravo Corp., shipyards at Pittsburgh and Wilmington, Del. to build and launch 444 hulls since the war's end. As of January 1, Dravo had orders for more than 110 hulls to be launched at its two yards.

Most of the above hulls are welded steel barges especially built for transport along our country's 6,000 miles of inland waterways. Custom-built barges for carrying hydrochloric acid, chlorine, sulfuric acid, pineapples, lumber and rolls of printing paper are among the barges completed. Under construction now are four 290 by 50 ft barges, the largest that Dravo has ever built.

* * *

Resistance Welder Sales Went Up During December

ORDERS for new resistance welding equipment placed with companies belonging to the Resistance Welder Manufacturers Association showed a gain of more than 80% over November totals. In addition, cancellation of orders dropped off in December to less than 1% of new business, a figure below the normal monthly average.

Included was a sizable increase in foreign orders, which reached a new peak for the year.

* * *

Eastman Kodak Licensed To Use Magnetic Sound Track

ARMOUR Research Foundation of Illinois Institute of Technology, Chicago, has licensed Eastman Kodak Co., Rochester, N. Y., to manufacture and sell motion-picture film with a magnetic sound track. The process promises to make sound movies for amateurs a practicality.

Eastman will sell film already coated with a magnetic sound track and will add a track to exposed film. The magnetic recorder was developed in the Armour research laboratories by Marvin Camras, a research physicist.

SAVE TIME . . . SAVE MONEY

Snap-tite

THE WELDING HOSE COUPLER THAT'S UNDERWRITER APPROVED

SAVE TIME . . . and MONEY in connecting or disconnecting your torch. With Snap-Tite Welding Hose Couplers, you snap on or snap off the torch by hand – quickly, easily, safely. No cross threading . . . no leaky connections . . . no kinking.

AUTOMATIC SHUT-OFF
Built-in valves close automatically when torch is disconnected. Gas does not have to be shut off at tank.

TESTED AND APPROVED by the Underwriters' Laboratories – your guarantee that Snap-Tite Welding Hose Couplers are absolutely safe.

GET THE FULL STORY NOW. Ask your distributor for a demonstration . . . or write the factory.

What zippers are to clothes SNAP-TITES are to hose

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Snap-tite

ERIE, PENNSYLVANIA

Omaha Welding Confab March 29, 30 and 31

Eleventh annual Welding Confab of the Omaha Welding Co., will be held March 29, 30 and 31 at the company headquarters, 1523 Marcy St., Omaha, Nebraska.

The "Confab," which is usually attended by over 1,500 job shop operators and weldors in the six-state territory covered by Omaha Welding, consists of three days of lectures on welding subjects, demonstrations and movies of interest to the welding fraternity. To date, some twenty manufacturers of welding equipment have indicated their intentions of exhibiting and demonstrating the applications of their products.

* * *

Youngstown Sheet & Tube Co. Builds Butt-Weld Tube Mill

A $16,000,000 expansion program of the Youngstown Sheet & Tube Co. will include construction of a continuous butt-weld tube mill company's plant in East Chicago, Ind. Also scheduled for the East Chicago plant is a new continuous furnace for the 10-in. skelp mill, three Diesel-electric locomotives, two new charging machines, new wash and locker building for the open hearth department and additional work on a rebuilt blast furnaces. Balance of the $16,000,000 program will be spent at the company's Youngstown, O., district and at plants of subsidiaries.

* * *

Oxygen Plant Installed At San Diego Gas Firm

PACIFIC Acetylene Co., 2205 Newton St., San Diego, Calif., recently completed installation of a $100,000 oxygen plant of advanced design. Liquid oxygen is made by one compressor operation. The liquid is then put through a heat exchanger by a pump rated at 2,400 psi for production of pure dry oxygen. No gas holder is required.

Glen R. Shell, owner and manager of the firm, says his new plant is the fourth of its type in the west, the others being at Spokane, Wash., Phoenix, Ariz., and Reno, Nev.

The equipment, manufactured by Superior Air Products Co., Newark, N. J., has a capacity of 1,250,000 cu ft a month, and provides an integrated plant for supplying both oxygen and acetylene to the expanding San Diego market. Previously, Pacific Acetylene had obtained its oxygen from Los Angeles.

* * *

Victor Equipment Appointed Distributor for Stud-Welders

DESIGNATION of Victor Equipment Co., San Francisco, as exclusive distributors for Nelson stud-welding equipment and products on the Pacific coast has been announced by Leonard C. Barr, vice-president of Morton Gregory Corp. and general sales manager of its Nelson Stud Welding Division, at Lorain, O.

The distributorship will cover both sale and rental of guns and control units and sale of Nelson flux-filled studs and other fasteners.

NEW!

Quick-On Quick-Off ATTACHMENT

for the M·S·A Combination SKULLGARD WELDING HELMET

This unique M.S.A. development permits instant attachment or removal of the Welding Helmet without removing Skullgard from head, enabling continuous head protection on the job. Helmet has spring-catch attaching posts, which slide into lugs on Skullgard and hold Helmet firmly in place. Light pressure on posts retracts catches, instantly freeing Helmet from the assembly. Conversion sets available for assemblies now in service. Bulletin CO-2.

FEATURES

- Combined Skullgard-Helmet Protection.
- Helmet Attached to or Removed from Skullgard While Skullgard is being Worn.
- Head Protection Every Minute On the Job.
- Simple, Practical, No Loose Parts!

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MINE SAFETY APPLIANCES COMPANY
Braddock, Thomas & Meade Sts., Pittsburgh 8, Pa.
At Your Service! 54 BRANCH OFFICES IN THE UNITED STATES AND CANADA

For BETTER • • MORE EFFICIENT SILVER BRAZING

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FLUX-POT

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FAST EFFICIENT FLUX HANDLING

Unit complete with 6-ft. rubber cord and plug.

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Fully automatic thermostat control set to keep flux at constant 180° temperature.

This pot provides a low-cost labor and material saving means of handling flux for Industrial Silver Brazing. ECONOMICAL . . . will pay its original cost in a short time by increasing brazing efficiency and output. Enables the user to extend volume of usable flux by 20% water dilution with practically no splash loss. GET DETAILS NOW!

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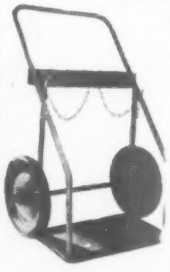
THE NEW "SUPER DE LUXE" GAS CYLINDER TRUCK

"SMOOTHEST TRUCK AFLOAT"



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CT-600—carries 244 Oxygen 100# Propane Cylinders.

CT - 500 — carries Oxy-Acetylene Cylinders of 100 to 285 cubic feet capacity.

CT - 250 — carries Oxy-Acetylene Cylinders of 60 to 120 cubic feet.

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Try this Counter Display. It is an excellent Merchandiser.

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About People

FRANK J. WHELAN, vice-president of Worthington Pump and Machinery Corp., will supervise the sale of welding positioners and turning rolls manufactured at the corporation's Dunellen, N. J., works. F. J. CONNOLLY will continue as manager of the welding positioner and turning roll sales division, and A. B. KIME will continue as eastern regional supervisor. P. J. PATTON, JR., will remain at Chicago as central regional supervisor for the division.

• • •

HARRY D. SWEENEY has been appointed sales manager of the welding products department of American Manganese Steel Division of American Brake Shoe Co.

• • •

LESLIE E. (BUD) BLUHM is Milwaukee field engineer for the Nelson Stud Welding Division of Morton Gregory Corp. Mr. Bluhm has worked with Allis-Chalmers Mfg. Co., with the Bureau of Ships as a welding engineer, and is a member of the American Welding Society.

• • •

M. M. MCELDERRY has resigned his position as welding technician with W. P. & R. S. Mars Co., Duluth, Minn., to devote his entire time to the Mack Welding Co. of the same city, in which he has an interest.

• • •

ROBERT W. MOFFETT, general manager of fabrication at Lukens Steel Co., retired on Feb. 1. RAYMOND M. DENNIS has been named as manager of fabrication-By-Products and FRANK C. KARDEVAN has been named manager of fabrication-Lukenweld.

• • •

ROBERT G. ALLEN has been elected vice-president of the Great Lakes Carbon Corp.'s Electrode Division with headquarters at Niagara Falls, N. Y.

• • •

C. K. RICKEL has been elected president of the Big Three Welding Equipment Co., Inc., Fort Worth, Texas, to replace B. K. Smith who died recently. H. K. SMITH is vice-president; A. SMITH, secretary; C. K. RICKEL, JR., treasurer; J. H. MORGAN, assistant secretary and treasurer.

• • •

JOSEPH V. KIELB, formerly assistant works manager, Easy Washing Machine Corp., Syracuse, N. Y., is now director of experimental development, Seeger Refrigerator Co., St. Paul, Minn.

• • •

JAMES F. MOORE, formerly service engineer at the Chicago branch of Black & Decker Mfg. Co., Towson, Md., has been appointed sales engineer at Chicago. T. J. WATER becomes the Chicago service engineer. W. E. BOYLES, service engineer at the New Orleans branch of the company, has been transferred to the Cleveland branch as sales engineer. R. B. MCCLELLAN takes Mr. Boyles' place at New Orleans. THOMAS ROGERS has been promoted to sales engineer at the Dallas branch.

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ELECTRIC AND GAS WELDING

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TYPES 2S, 43 and 52
Brazing 716

FOR CAST ALUMINUM

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Types 142, 195, 355 and 356
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3/16" size only

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ST. LOUIS 7, MISSOURI

R. W. (PAT) MURPHEY has been designated advertising manager for Taylor Forge & Pipe Works, Chicago.

* * *

CHARLES S. CRAIGMILE is president of Belden Mfg. Co., Chicago. ARTHUR L. WANNER is vice-president and treasurer of the company.

* * *

DALE E. MILLER will represent W. P. and R. S. Mars Co., welding distributors of Duluth, Minn., in northern Minnesota. JOHN M. SCHERINGER is sales representative for the company in northern Wisconsin and the upper peninsula of Michigan.

* * *

L. E. OSBORNE, senior executive vice-president of Westinghouse Electric Corp., will be the featured speaker at the national banquet of the American Society of Tool Engineers in Pittsburgh, March 12.

* * *

GEORGE O. WITH has been appointed assistant vice-president of United States Steel Supply Co., Chicago. CLIFFORD W. LORD has been elected vice-president in charge of all Pacific coast warehouses of the company.

* * *

GEORGE G. TSCHUME, manager of photographic lens sales at Bausch & Lomb Optical Co., Rochester, N. Y., has been elected president of the American Society of Photogrammetry.

* * *

WILLIAM E. GAHL has been appointed chief engineer of Templeton, Kenly & Co., Chicago, makers of Simplex jacks.

* * *

HENRY J. KINGSBURY, chief engineer of Hammond Machinery Builders, Inc., Kalamazoo, Mich., makers of abrasive equipment, has entered partial retirement after 50 years with the company.

* * *

W. R. CUNNICK, formerly assistant vice-president and general manager of sales of Weirton Steel Co., Weirton, W. Va., has been appointed vice-president and general manager of sales for Great Lakes Steel Corp., Detroit.

* * *

DR. FRANK B. JEWETT has accepted an appointment as a member of the board of trustees of Battelle Institute, Columbus, O.

* * *

WYLIE BROWN, president of Phelps Dodge Copper Products Corp., has been elected chairman of the board and will continue as chief executive officer. WHIPPLE JACOBS, formerly president of the Belden Mfg. Co., Chicago, joined Phelps Dodge in January as president.

* * *

ED. FOOTE, formerly manager of the Cincinnati plant of Burdett Oxygen Co., has been named sales manager of the Indianapolis branch of Sutton-Garten Co.

* * *

Died . . .

WILLIAM ROBERT CLARK, 51, district manager for the Linde Air Products Co. at Seattle, Wash., died Jan. 12 at Spokane. He was born in Salt Lake City. Four years ago he moved to Seattle from Kansas City, Mo.

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It contains low-temperature welding rods, and fluxes for every type of gas welding job encountered in maintenance and repair work . . . a supply of 11 different kinds of low-temperature welding rods, low-temperature galvanizing powder, and 8 fluxes. No matter what the job, this professional service kit meets the need—and it's so easy and economical to use.

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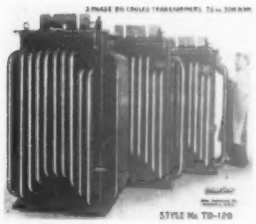
TRANSFORMERS



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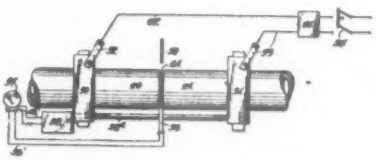
From the Patent Office

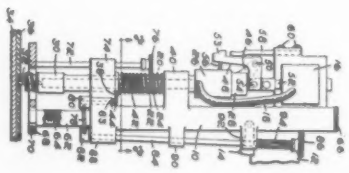
R-W and Filler Metal Butt Welding

2,453,061. HERBERT A. BISSOUT, Merchantville, N. J., and WILLIAM Y. BORRESEN, Philadelphia, assigned to W. K. Mitchell & Co., Inc., Philadelphia. Filed May 27, 1943. Issued Nov. 2, 1948.



Patent pertains to the process of butt welding transverse joints in metallic tubes. It consists of forming thin opposing lips at the extreme inner edge of a transverse joint and cutting away outer metal adjacent these lips to form the bottom of a weld groove. The lips are placed in opposed contact. Passing electric current across the joint heats the lips to welding temperature whence they are pressed one against the other to pressure weld them. The circumferential space about the pipe is filled with added weld metal while the lips are kept intact at the inside of the weld.

* * *



Stud Welding Gun

2,451,190. FRANK W. ANDERSON, North Weymouth, Mass. Filed April 22, 1947. Issued Oct. 12, 1948.

A stud welding gun is composed of a frame, a stud holder movable longitudinally on the frame and means urging the stud holder toward the work. A stud received in the holder is pressed against the work when the bottom of the frame rests on it. An electro-magnet mounted on the frame has a movable armature. A dog is pivotally connected to the holder and the armature for retracting the holder and stud when the magnet is energized. The dog has a latch which engages a stop member when the bottom of the frame rests on the work and the magnet is de-energized. The latch is moved out of engagement with the stop member by movement of the armature upon energization of the magnet. The holder is thus retracted and the stud moved a predetermined distance from the work.

ALADDIN
ROD AND PATENTED METHOD

NO PUDDLING • NO FLUX

Weld White Metal
(POT METAL - DIE CAST)
Solder and Braze Aluminum
Repair Kirksite Dies
Easily and Quickly
with Gas or Carbon Arc . . .

Melting Point 732° F. Tensile Strength lbs./Sq. in. 47,300. Shearing Strength lbs./Sq. in. 45,800. Meets Air Corps Specification No. 10302. Instructions with every pound. Sizes 1/32", 1/16", ⅛", 5/32", 3/16", ¼". Complete Assortment, and $1.00 Trial Package.

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Spatter doesn't matter with the new Hargrave No. 41 Welders' Clamp. The No. 41 Welders' Clamp features a patented solid alloy screw that permanently resists spatter. Clamp has been designed with the aid of welding engineers and operators. Frame is of forged steel, heat treated for maximum strength and long life. Each clamp is *Individually Tested*. The No. 41 Regular Service Welders' Clamp is manufactured in 2, 4, 6 and 8 inch openings. Also available in Heavy Service pattern (No. 43 Heavy Service Welders' Clamp) in 4 to 12 inch openings.

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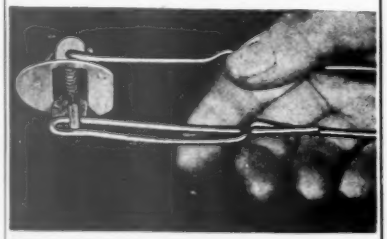

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The patented cartridge holding the spark metal locks exactly in correct position, permitting instant replacement. Get acquainted with the many other superior, exclusive features of Improved Round File.

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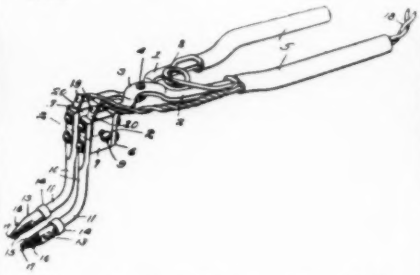
LYNN, MASSACHUSETTS

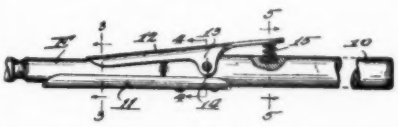
Electric Soldering Tool

2,451,290. C. Paul Kephart, Jersey City and Walter Erich Jerichow, Far Hills, N. J. Filed July 27, 1945. Issued Oct. 12, 1948.



New electric soldering tool includes levers pivotally connected between their ends. Insulating blocks are joined to the ends of the levers. Springs hold the blocks normally pressed toward each other. Arms of conducting material are secured at one end to the block. The arms are parallel, the other ends of the arms being respectively formed as fingers. The tips are carried by the respective fingers.

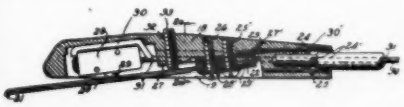
* * *



Electrode Grip and Holder

2,453,244. Ivan M. Matson, Los Angeles, Calif. Filed May 15, 1946. Issued Nov. 9, 1948.

An electrode grip and holder comprises a handle, a channel-shaped jaw secured to and projecting forwardly from the handle and an inverted channel-shaped jaw pivotally mounted on the handle a short distance rearwardly from its forward end. The forward end of the pivoted jaw terminates between the forward end of the handle and the forward end of the fixed jaw. An expansion spring is between the handle and the rear end of the pivoted jaw.



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Welding Apparatus

2,454,338. Albert F. Pityo, Clifton, and Harry E. Butterfield, Jr., Maplewood, N. J. Filed June 13, 1947. Issued Nov. 23, 1948.

A welding apparatus has electrodes for receiving work between them and receives current from a welding circuit. At least one of the electrodes is a resilient elongated blade. A handle carrying the resilient elongated blade electrode extends longitudinally of the electrode and overlapping it. A switch for closing the welding circuit is mounted upon the handle and has a movable part arranged to be shifted by the flexing of the resilient electrodes. An adjustable element mounted upon the handle engages the resilient electrode.

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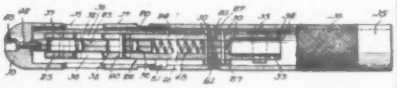
Chicago, Cincinnati, Cleveland, Dallas, Detroit, Los Angeles, San Francisco, etc.

160 Field Engineers to Help You

America's Welding Alloy Specialists

Welding Electrode Holder

2,454,617. ERIC SIEMERS, Kalamazoo, Mich., assigned to Lacey-Webber Co. Kalamazoo. Filed Jan. 21, 1944. Issued Nov. 23, 1948.



A electrode holder has elongated metal top and bottom members having sides secured to them to form a hollow body member of square cross section. A metal plunger is located within the body member and adapted to reciprocate in it. A spring within the hollow body member maintains the plunger in a forward position with its forward end protruding. The top and bottom members adjacent the forward end of the body member have aligned openings for receiving an electrode. The plunger has an opening for receiving the electrode. The body member and plunger comprise gripping jaws. Opening in the plunger is positioned so that it does not coincide with the openings in the body member except when the plunger is retracted against the spring. Tubular covers of insulating material insulate the metal body member. One of the covers is secured to the body and the other secured to the protruding end of the plunger.

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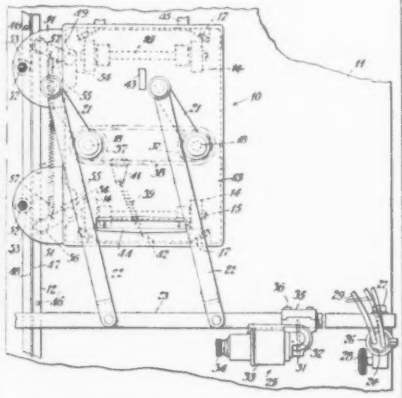

Universal Torch Machine

2,452,189. RICHARD F. HELMKAMP, Jersey City, N. J., assigned to Air Reduction Co., Inc. Filed Oct. 9, 1944. Issued Oct. 26, 1948.

A universal torch machine comprises a carriage having wheels adapted to run directly on a work-piece surface and a torch mounted on the carriage for lateral movement. A guiding strip is adapted to be fastened to the work-piece and has two vertical faces. A pair of rolls, one of which is mounted near the front of the carriage, and the other of which is mounted near the rear, are arranged to engage one of the vertical faces of the guiding strip. A second roll cooperating with each of the first named rolls engages the other vertical face of the strip. Roll-support arms respectively carry the last-named rolls and are pivotally connected to the torch carriage for movement in a horizontal plane. Means directly connect the roll-support arms for maintaining them in equalized, clutched relation with the guiding strip faces.

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